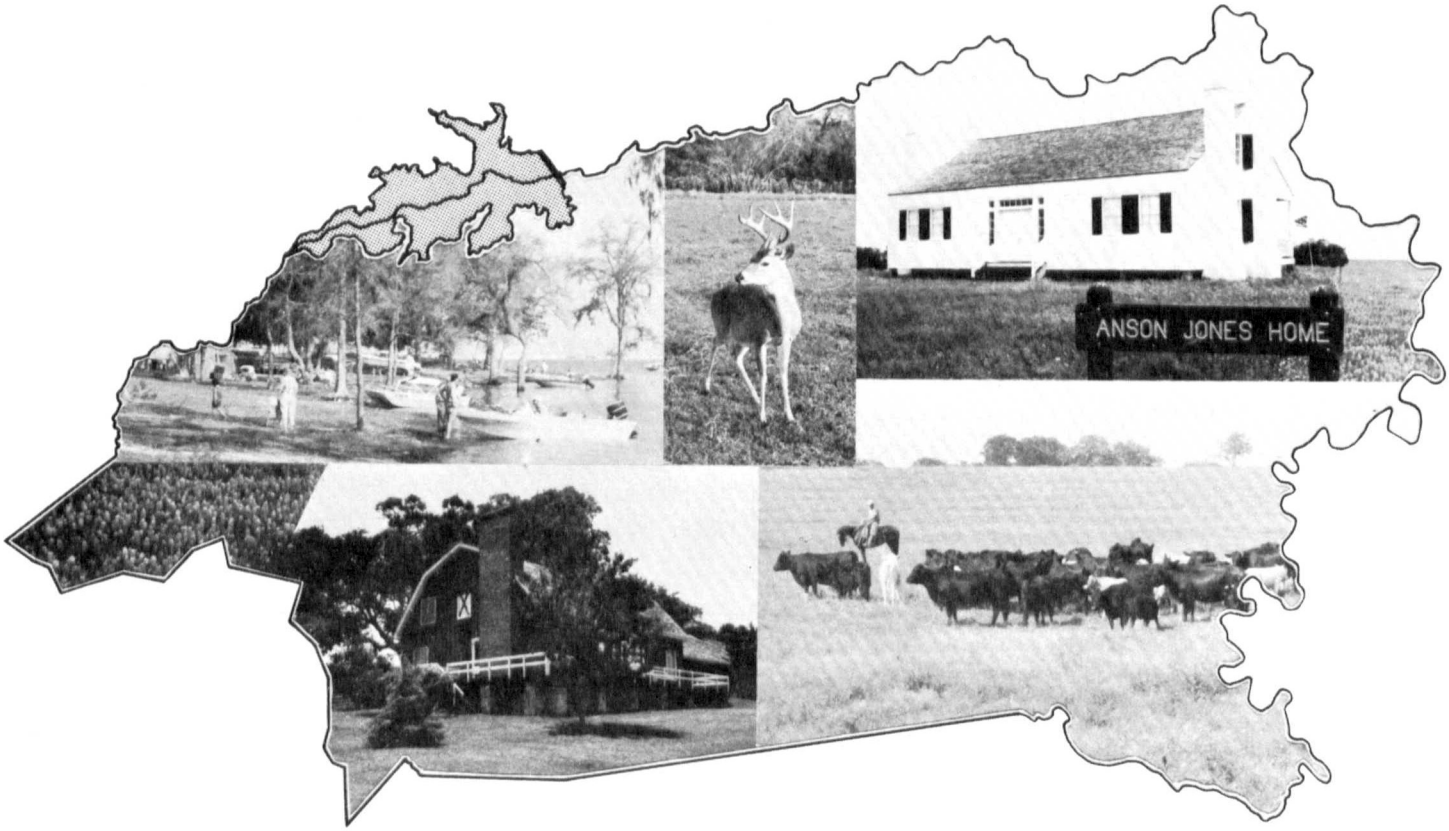
SOIL SURVEY OF

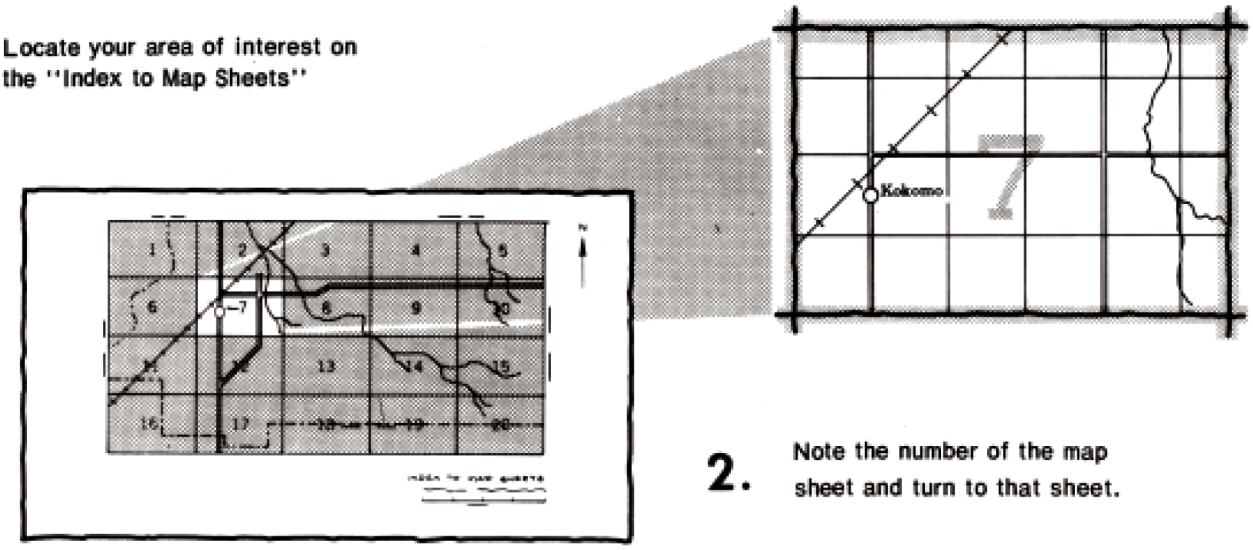
Washington County
Texas



United States Department of Agriculture
Soil Conservation Service
In Cooperation with
Texas Agricultural Experiment Station

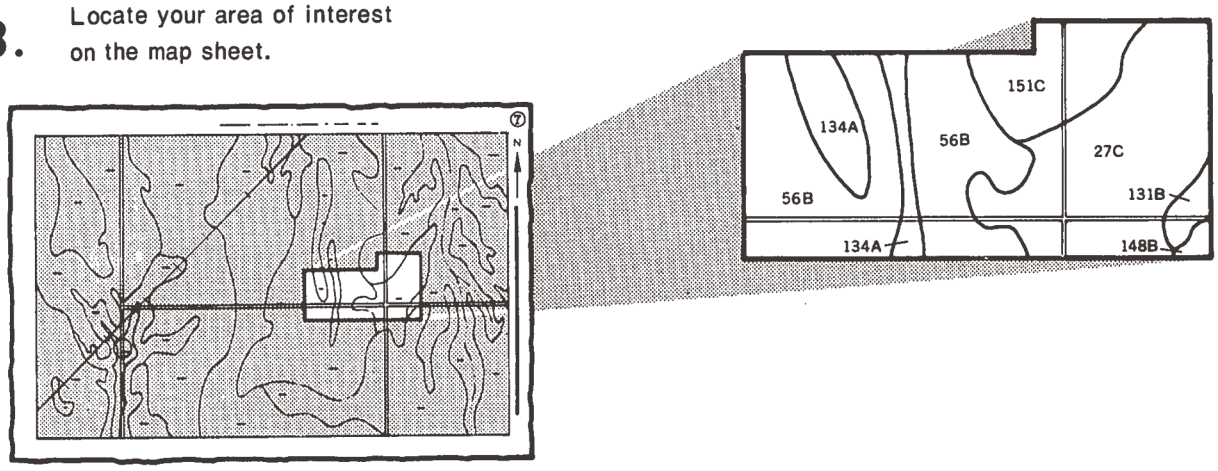
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

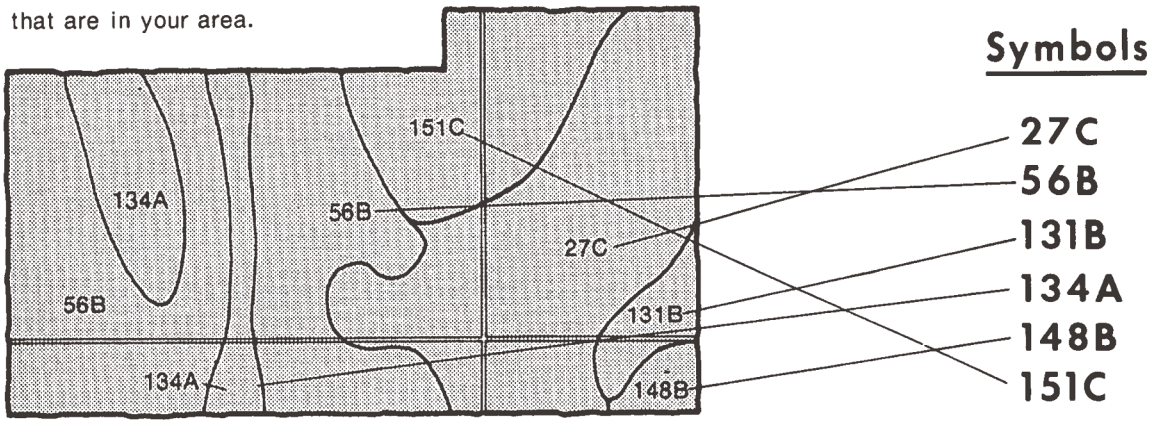


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

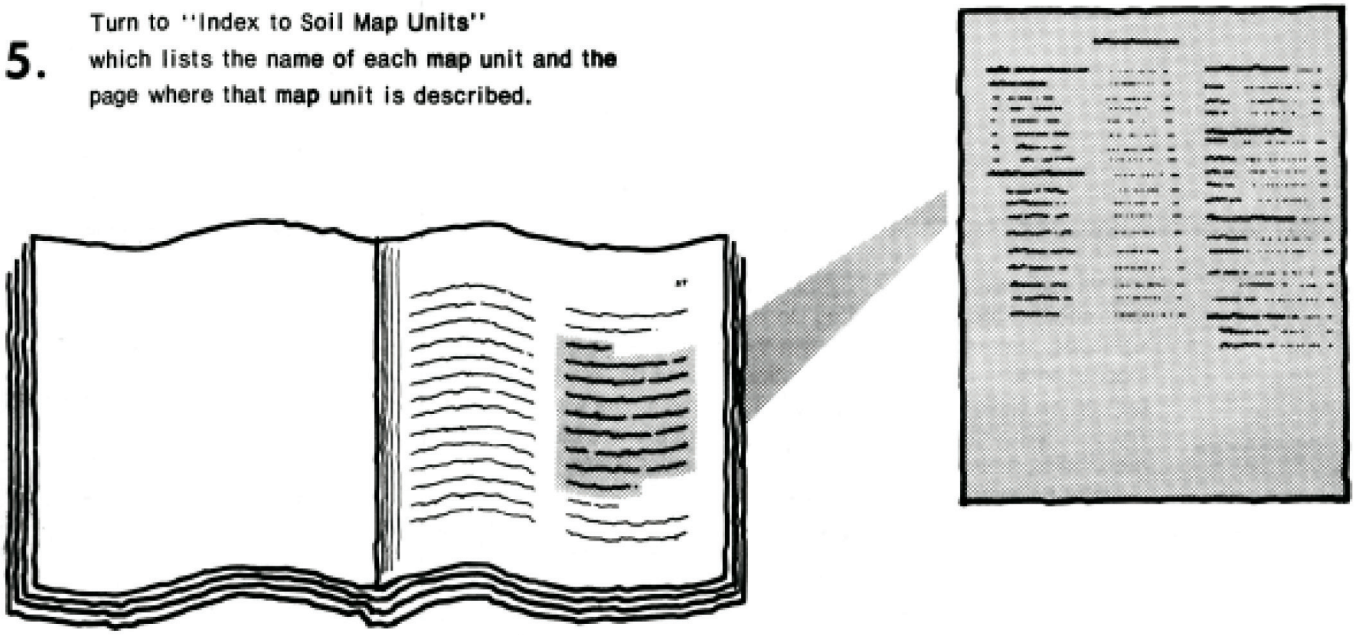


4. List the map unit symbols that are in your area.

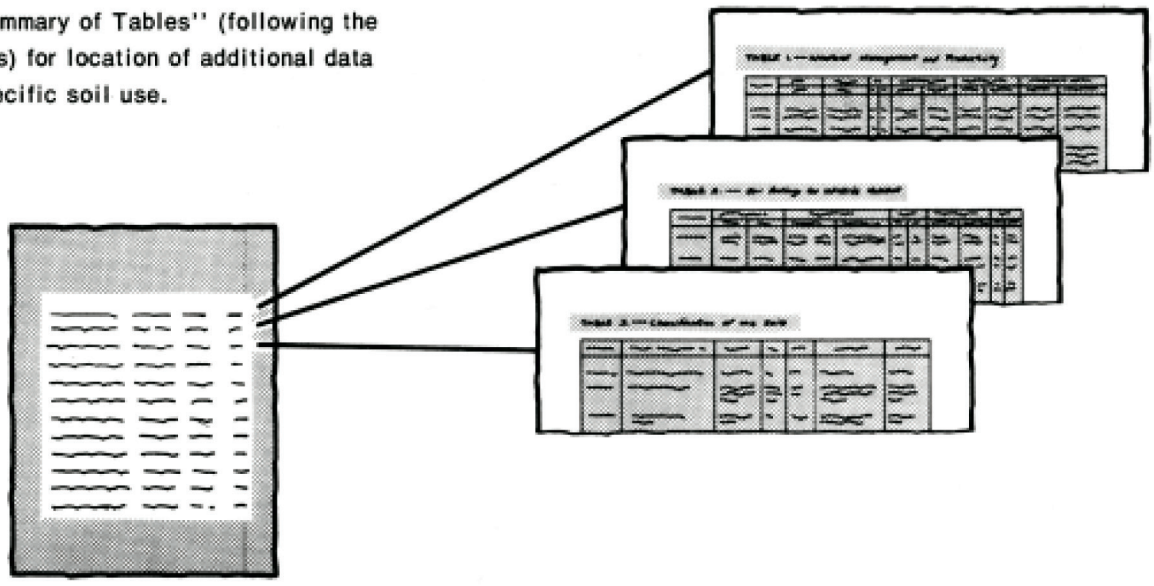


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1968-78. Soil names and descriptions were approved in 1978. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Washington Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: The mosaic, in the shape of Washington County, shows some of the major land uses and other features of the county—wildlife, recreation, raising cattle, and native bluebonnets. The home of pioneer Anson Jones is an historical landmark.

contents

soil series

Issued April 1981

Index to map units

U. S. DEPARTMENT OF AGRICULTURE

Soil Conservation Service

Washington, D. C. 20013

Soil Survey of Washington County, Texas

[E R R A T A]

Page 15, map unit 9, last sentence, change capability subclass IIe to IIw.

Page 15, map unit 10, last sentence, change capability subclass IIw to IIe.

Page 97, Table 6, use the following table:

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	5,540	---	---	---	---
II	61,680	46,880	14,800	---	---
III	130,938	119,108	7,870	3,960	---
IV	121,400	117,960	---	3,440	---
V	46,700	---	46,700	---	---
VI	16,430	14,450	830	1,150	---
VII	2,760	660	---	2,100	---
VIII	---	---	---	---	---

All Map Sheets - Units 16 and 17 are reversed on all map sheets where these soils are shown. When using the maps, simply substitute unit 16 for 17, and unit 17 for 16. The text is correct.

Map Sheet 12 - Change Keer Creek to Kerr Creek. Index to map sheets is correct.

Map Sheet 22 - At top of sheet (Joins sheet 29) should be exchanged with (Joins sheet 14) at bottom of sheet. Index to map sheets is correct.

summary of tables

foreword

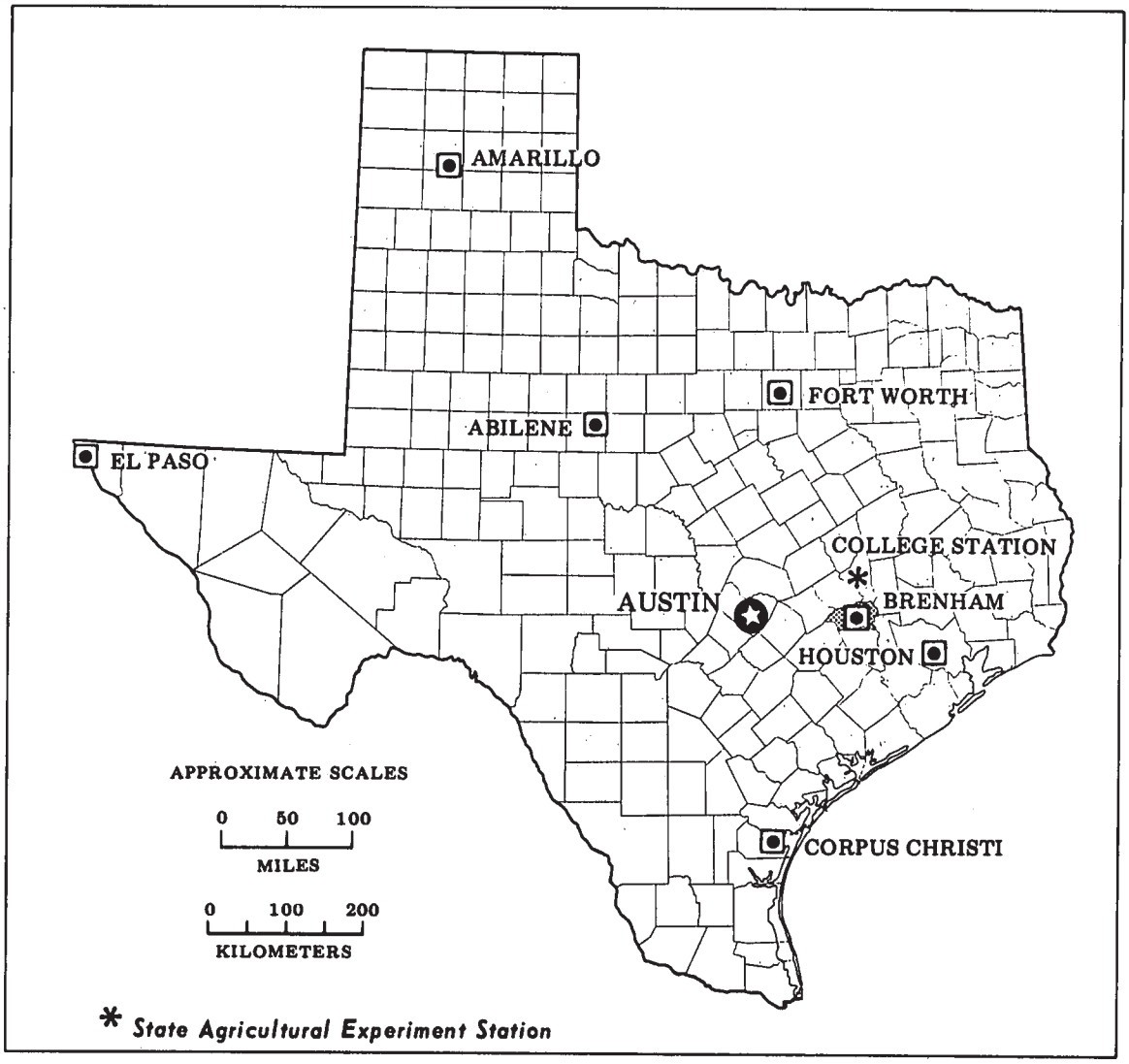
This soil survey contains information that can be used in land-planning programs in Washington County, Texas. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

George C. Marks
State Conservationist
Soil Conservation Service



Location of Washington County in Texas.

soil survey of
Washington County, Texas

By W Glen Chervenka, Joseph J. Castille, Maurice R. Jurena,
and Michael Stewart, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
in cooperation with the Texas Agricultural Experiment Station

WASHINGTON COUNTY is located in southeast central Texas in the Blackland Prairies Land Resource Area and the Claypan Land Resource Area. It has a total of 392,960 acres, or 614 square miles. The county has an irregular shape and is approximately 40 miles long and 20 miles wide.

The survey area is mostly gently sloping to sloping, but some parts of the landscape are nearly level and some parts are moderately steep and steep. The elevation ranges from 200 to 500 feet and is highest in the northern part of the county.

The main agricultural industries of the county are beef production and dairying. Some cultivated crops are grown.

The soils formed under post oak and grass. Those soils that formed under timber are light-colored fine sandy loams and loamy fine sands, and those that formed under grass are dark fine sandy loams, clay loams, and clays. If unprotected, these soils are subject to water erosion.

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent counties. Differences are the result of better knowledge of soils, modifications of series concepts, intensity of mapping, or the extent of soils within the survey.

general nature of the survey area

In this section the settlement and population, climate, agriculture, and natural resources are briefly described.

settlement and population

Washington county, named for George Washington, was created in 1836 from a part of Stephen F. Austin's colony. This county was of great importance to the early settlement of Texas. Among many other historical places is Washington On The Brazos, the birthplace of Texas independence. Brenham, the county seat, had a population of 8,922 in 1970. The county population in 1970 was 18,842. The major settlement of the county was in the 1850's and 1860's mainly by immigrants of German, Czechoslovakian, and Polish descent.

At present the county is crossed by three major highways that join central and south-central Texas with Houston and the gulf coast.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Brenham, Texas, in the period 1951 to 1976. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 52 degrees F, and the average daily minimum temperature is 41 degrees. The lowest temperature on record, which occurred at Brenham on February 2, 1952, is 9 degrees. In summer the average temperature is 83 degrees, and the average daily maximum temperature is 95 degrees. The highest recorded temperature, which occurred on August 11, 1962, is 110 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 39.65 inches. Of this, 21 inches, or 50 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 15 inches. The heaviest 1-day rainfall during the period of record was 6.85 inches at Brenham on September 12, 1961. Thunderstorms occur on about 30 days each year, and most occur in summer.

Snowfall is rare. In 80 percent of the winters, there is no measurable snowfall. In 10 percent, the snowfall, usually of short duration, is more than 3 inches. The heaviest 1-day snowfall on record was more than 3 inches.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The sun shines 80 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 15 miles per hour, in April.

Tornadoes and severe thunderstorms occur occasionally. These storms are local and of short duration. The pattern of damage is variable and spotty.

agriculture

The main agricultural enterprises in Washington County are beef and dairy cattle ranches. A small amount of row crops, such as corn, cotton, and grain sorghum, are grown.

During early settlement almost all of the county was cultivated. The rolling topography, slope, and soil erosion have reduced the yields of row crops. Recently, much of the land has been used for pasture, and cattle production has increased. Established pastures of improved bermudagrass, kleingrass, and bahiagrass have replaced areas of native grass and old, eroded fields.

Approximately 60 percent of the county belongs to absentee owners, most of whom reside in the city of Houston, about 70 miles away. Many people have retired to this area and others plan to do so. The small farms are for recreation and retirement. These people increase the value of their properties by improving buildings, constructing fences, building roads, planting grasses, and controlling erosion.

natural resources

Soil is the most important natural resource in Washington County. Oil, gas, lignite, rock, gravel, and water are also important. Numerous shallow oil wells are in the southwest part of the county. A limited amount of lignite is in the north part of the county. Rock and gravel are in the northern and the eastern parts of the county. Underground water for home use is easily available throughout the central part of the county. Lake Somerville is also a good source of high quality water.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The 11 general soil map units in Washington County make up about 98 percent of the total acreage. The remaining 2 percent is areas of water.

soil descriptions

well drained and moderately well drained, clayey and loamy soils; on uplands

The soils in this group make up about 46 percent of the county. The major soils are of the Bleiblerville, Frelsburg, Latium, Carbengle, Klump, and Renish series. They are gently sloping to strongly sloping and on uplands. The soils have a clayey to sandy surface layer and a clayey to loamy subsoil.

The soils are used mainly for crops and pasture. The major crops are corn and grain sorghum. Improved bermudagrass, kleingrass, and bahiagrass are the principal improved grasses for pasture.

1. Bleiblerville-Frelsburg

Deep, gently sloping and sloping, moderately alkaline, clayey soils

This map unit makes up about 16 percent of the county. It is made up of about 35 percent Bleiblerville soils, 30 percent Frelsburg soils, and 35 percent soils of minor extent (fig. 1). Slopes are 1 to 8 percent.

Bleiblerville soils are on less sloping parts of the landscape, and Frelsburg soils are on more sloping parts.

The Bleiblerville soils are calcareous, moderately alkaline clay to a depth of more than 60 inches. They are very dark gray in the upper part, dark gray in the middle part, and pale yellow in the lower part.

The Frelsburg soils are dark gray clay to a depth of about 55 inches and are light gray clay below. They are moderately alkaline and calcareous throughout.

Minor soils in this unit are Brenham, Latium, Trinity, and Wilson soils. The Brenham and Latium soils are on more sloping parts of the landscape. The Trinity soil is in small areas on bottom land. The nearly level Wilson soil is on old terraces adjacent to streams.

The soils of this map unit are used primarily for corn and grain sorghum. The larger areas of gently sloping soils are used for cultivated crops, and the sloping soils are used for improved pasture.

These soils have high potential for crops. Present economic conditions prevent these soils from being used more extensively for crops. The soils also have high potential for improved pasture. They are well suited to improved bermudagrasses and kleingrass.

The soils have low potential for urban and recreational development. The high shrink-swell properties, very slow permeability, and clay texture are the major limitations for urban development. Recreational development is mainly limited by clay texture, very slow permeability, and slope.

2. Frelsburg-Latium

Deep, gently sloping to strongly sloping, moderately alkaline, clayey soils

This map unit makes up about 13 percent of the county. It is made up of about 35 percent Frelsburg soils, 35 percent Latium soils, and 30 percent soils of minor extent. Slopes are 1 to 12 percent.

The Frelsburg soils are dark gray clay to a depth of about 55 inches and light gray clay below. They are moderately alkaline and calcareous throughout.

The Latium soils are moderately alkaline, calcareous clay to a depth of about 70 inches. The upper part is dark grayish brown, the middle part is light olive brown, and the lower part is light gray.

Minor soils in this unit are the Bleiblerville, Brenham, and Trinity soils. The Bleiblerville soil is on less sloping parts of the landscape. The Brenham soil is on the upper slopes. The Trinity soil is in small areas of bottom land.

Most of the soils of this map unit have been cultivated in the past and are now in improved or native pasture.

These soils have low potential for crops. Slope and some areas of eroded soils are the most restrictive factors. The soils have high potential for improved pasture. They are suited to improved bermudagrasses and kleingrass.

The potential for urban and recreational development is low. The high shrink-swell properties, very slow permeability, clay texture, and slope are the major limitations for urban development. Recreational development is limited by clay texture, very slow permeability, and slope.

3. Carbengle-Klump

Moderately deep and deep, gently sloping and sloping, slightly acid to moderately alkaline, loamy and sandy soils

This map unit makes up about 11 percent of the county. It is made up of about 30 percent Carbengle soils, 25 percent Klump soils, and 45 percent soils of minor extent (fig. 2). Slopes are 1 to 8 percent.

The Carbengle soils are moderately alkaline, calcareous clay loam. Sandstone is at a depth of about 34 inches. The upper part of these soils is very dark gray, and the lower part is light gray and white.

The Klump soils are a brownish loamy sand to about 13 inches. The subsoil is a reddish sandy clay loam that grades to sandy loam below a depth of about 50 inches. These soils are slightly acid to strongly acid.

Minor soils in this unit are Bosque, Brenham, Cuero, Frelsburg, Knolle, and Renish soils. The Bosque soil is in small areas of bottom land. The Cuero soil is on concave foot slopes. Brenham, Renish, and Frelsburg soils are on upper side slopes. The Knolle soil is on crests of hills and ridges.

Most of the soils of this map unit have been cultivated in the past but are now in improved or native grasses.

These soils have medium potential for crops. Slope and, in places, depth to rock are restrictive features. The soils have high potential for improved pasture. They are suited to improved bermudagrass and kleingrass. Bahiagrass is adapted to the acid soils in this unit.

The potential for urban and recreation uses is medium.

4. Carbengle-Frelsburg-Renish

Deep to very shallow, gently sloping to strongly sloping, moderately alkaline, loamy and clayey soils

This map unit makes up about 7 percent of the county. It is made up of 30 percent Carbengle soils, 30 percent Frelsburg soils, 20 percent Renish soils, and 20 percent soils of minor extent (fig. 3). Slopes are 1 to 12 percent.

Carbengle soils have a surface layer of very dark gray clay loam about 12 inches thick. From 12 to 34 inches is a light gray to white clay loam. Below this is a weakly cemented sandstone. These soils are moderately alkaline and calcareous throughout.

Renish soils have a surface layer of dark grayish brown clay loam. Sandstone is at a depth of 12 inches. These soils are moderately alkaline and calcareous throughout.

Minor soils in this unit are Bleiblerville, Trinity, Brenham, and Latium soils. The Bleiblerville soil is on sloping, broad ridgetops. The Brenham soil is on the higher slopes. The Latium soil is on the strongly sloping parts of this landscape. The Trinity soil is on bottom lands.

This map unit is used mainly for improved pasture and rangeland.

These soils have medium potential for crops. Depth to rock limits cultivation in some places. Slope and the clayey texture are also limitations. These soils have high potential for improved pasture. Improved bermudagrass is suited, except to the shallow and very shallow Renish soil. The Renish soils are better suited to native grasses.

These soils have low potential for urban and recreational development. Shrink-swell properties, depth to rock, and slope are limitations for urban development. Recreational development is limited mainly by depth to rock and slope. This map unit is picturesque and scenic.

Moderately well drained and somewhat poorly drained, loamy and sandy soils; on uplands

The soils in this group make up about 16 percent of the county. The major soils are of the Chazos, Tremona, Crockett, and Tabor series. They are gently sloping and sloping and on uplands. The surface layer is loamy and sandy; in some areas it is very gravelly. The subsoil is clayey.

The soils are used mainly for improved pasture and rangeland. Improved bermudagrass and bahiagrass are the principal improved grasses for pasture.

5. Chazos-Tremona-Crockett

Deep, gently sloping and sloping, medium acid, sandy and loamy soils

This map unit makes up about 15 percent of the county. It is made up of about 25 percent Chazos soils (fig. 4), 15 percent Tremona soils, 15 percent Crockett soils, and 45 percent soils of minor extent. Slopes are 1 to 8 percent.

Chazos soils have a surface layer of brown loamy fine sand about 12 inches thick. The subsoil is clayey and mottled with reds, browns, and grays. These soils are typically medium acid in the upper part and moderately alkaline in the lower part.

Tremona soils have a brown surface layer of loamy fine sand about 28 inches thick. A clayey subsoil is mottled with grays, yellows, and browns and extends to a depth of 60 inches or more. These soils are medium to strongly acid.

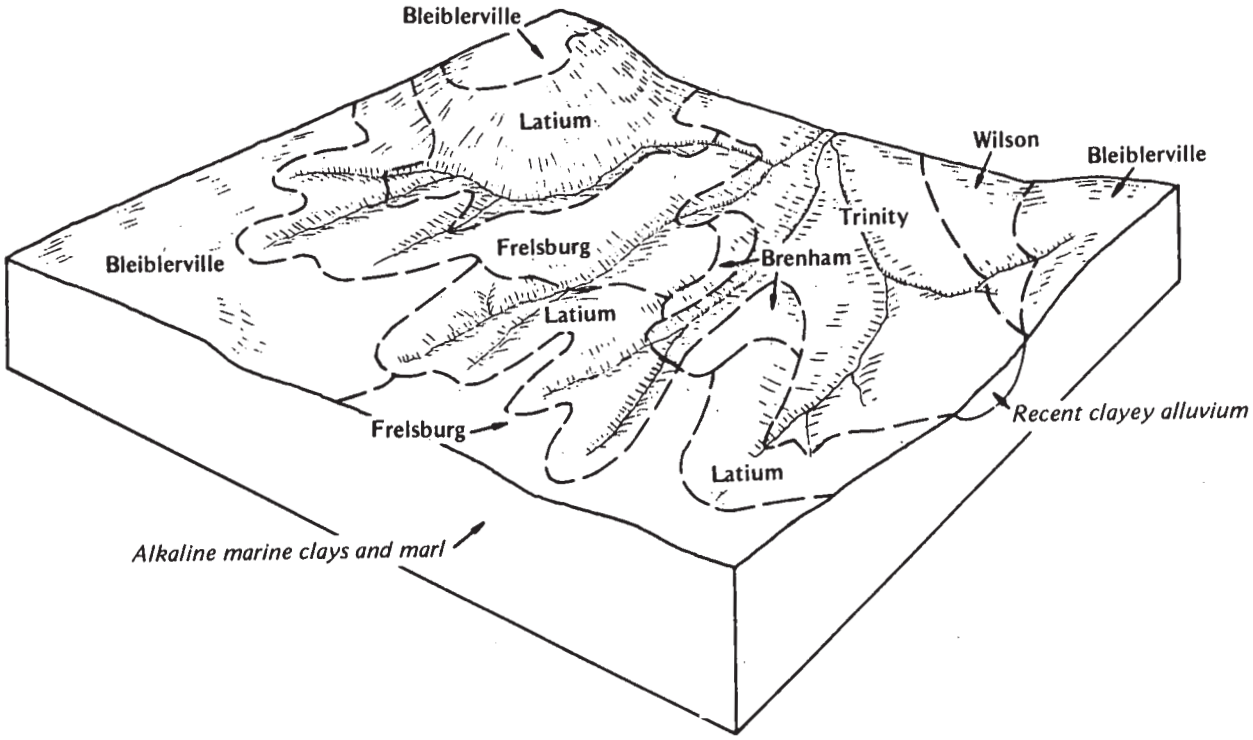


Figure 1.—The Bleiblerville-Frelsburg General Soil Map Unit.

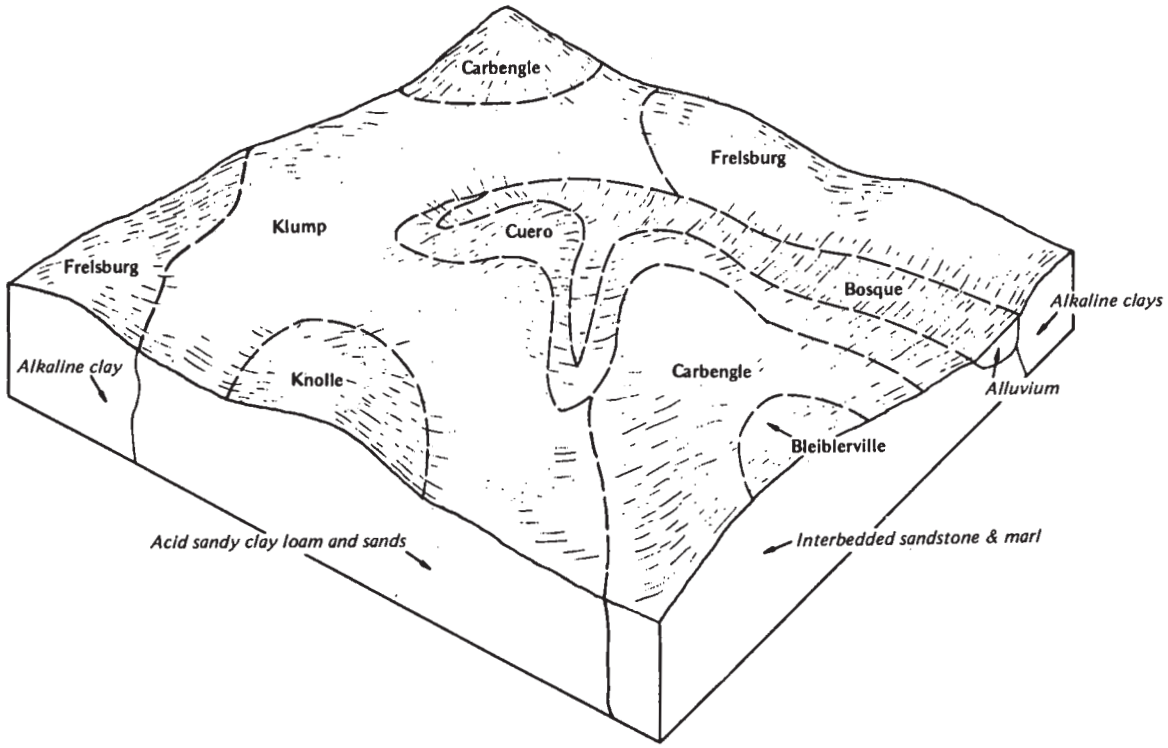


Figure 2.—The Carbengle-Klump General Soil Map Unit.

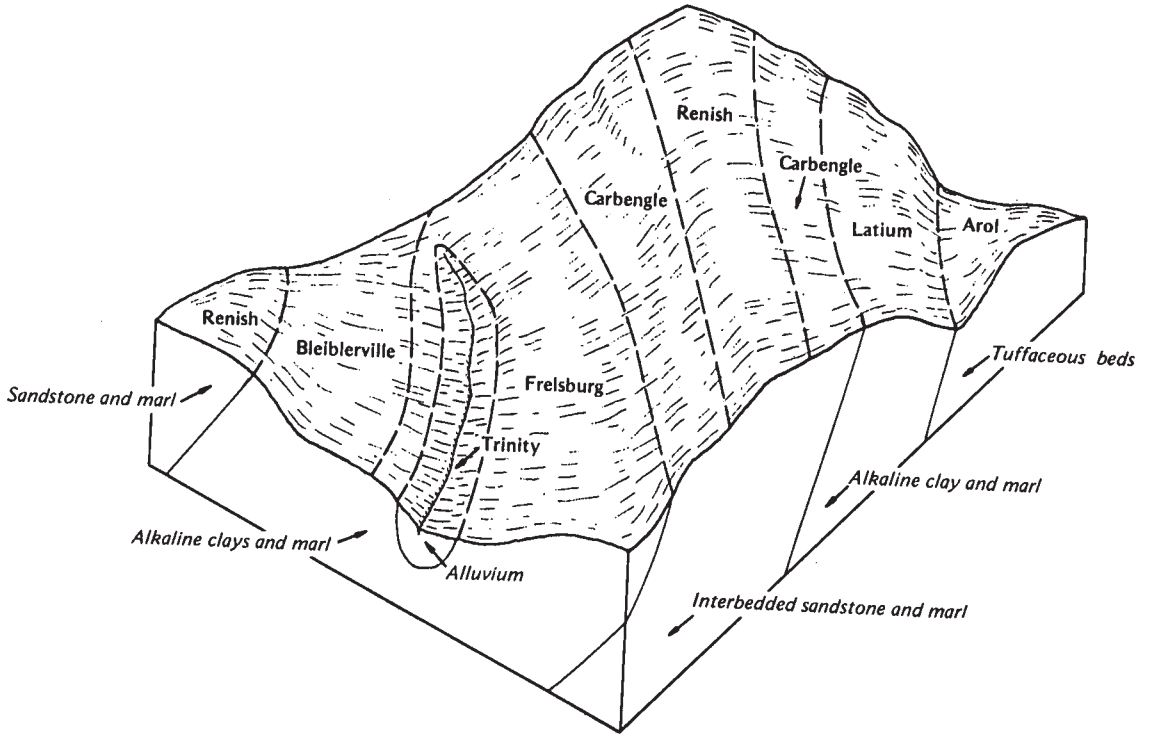


Figure 3.—The Carbengle-Frelsburg-Renish General Soil Map Unit.

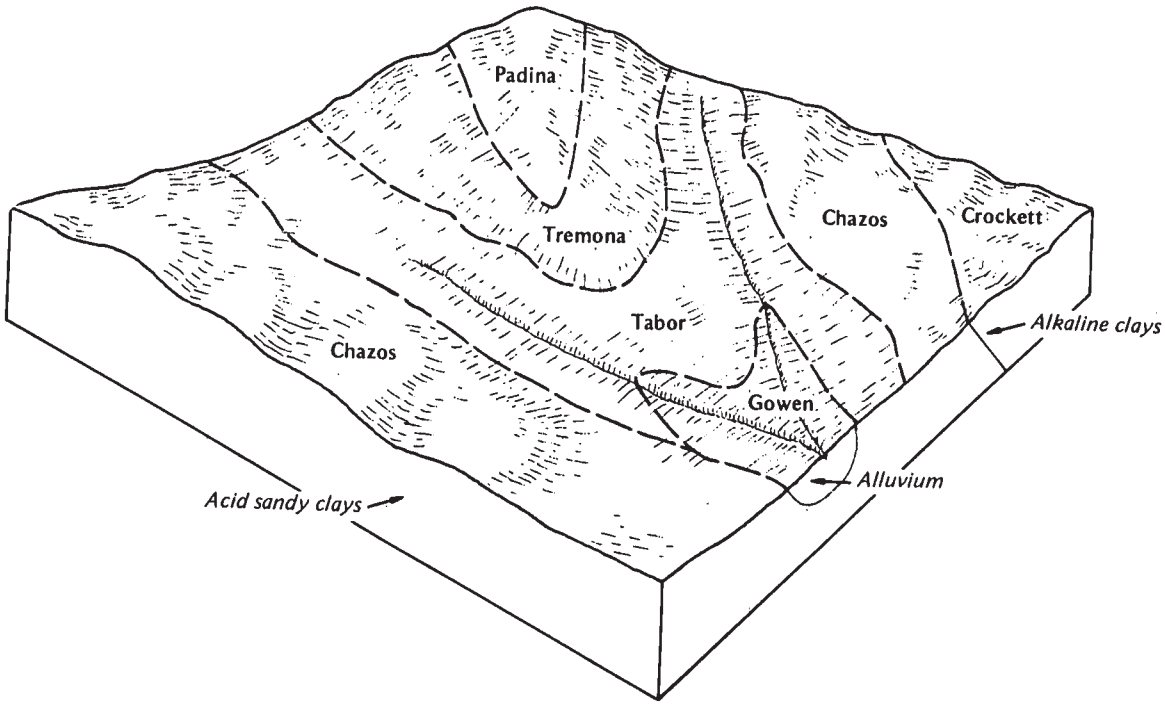


Figure 4.—The Chazos-Tremona-Crockett General Soil Map Unit.

Crockett soils have a surface layer of light brownish gray, slightly acid fine sandy loam about 7 inches thick. A clayey subsoil mottled with grays, reds, browns, and yellows extends to a depth of 60 inches. Crockett soils are typically slightly acid in the upper part and moderately alkaline in the lower part.

Minor soils in this unit are Axtell, Padina, Silawa, and Tabor soils. The Axtell soil is on upper slopes. The Padina and Silawa soils are on terraces adjacent to creeks. The Tabor soil is on foot slopes along drainageways.

This unit is used mainly for improved pasture and rangeland. Some smaller areas are used for truck crops.

The soils have low potential for crops. Low fertility limits cultivation. These soils have high potential for improved pasture. They need to be fertilized. Improved bermudagrass and bahiagrass are well suited.

These soils have low potential for urban and recreational development. Very slow permeability, the sandy surface layer, and shrink-swell properties are the limitations for urban development. Recreational development is limited by very slow permeability and the sandy surface layer.

6. Tabor

Deep, gently sloping, slightly acid, very gravelly loamy soils

This map unit makes up slightly less than 1 percent of the county. It is made up of about 50 percent Tabor soils and 50 percent soils of minor extent. Slopes are 1 to 5 percent.

Tabor soils have a surface layer of very pale brown, slightly acid very gravelly fine sandy loam about 16 inches thick. Medium acid clay mottled with brownish yellow, light brownish gray, and white extends to a depth of 80 inches or more.

Minor soils in this unit are mainly Lufkin soils and the nongravelly Tabor fine sandy loam. The Lufkin soil is nearly level and in low areas. The Tabor fine sandy loam is on foot slopes. It is above the Lufkin soil but is below the very gravelly Tabor soil.

This unit is used mainly for rangeland, wildlife, and pasture of primarily bahiagrass.

These soils have low potential for crops because of the high content of gravel. They also have low potential for improved pasture. Low fertility, low available water capacity, and difficulty in establishing grasses are the limiting factors.

These soils have low potential for urban and recreational development. Gravel content and very slow permeability are limitations for urban development. Recreational development is limited mainly by gravel content and very slow permeability.

Well drained and somewhat poorly drained, loamy soils; on uplands and terraces

The soils in this group make up about 17 percent of the county. The major soils are in the Falba, Burlewash, Lufkin, and Mabank series. They are gently sloping to steep and on uplands and ancient terraces. The soils have a loamy surface layer and a clayey subsoil.

The soils are used mainly for pasture and rangeland. Improved bermudagrass and bahiagrass are the principal grasses for pasture.

7. Falba-Burlewash

Moderately deep, gently sloping and sloping, strongly acid and very strongly acid, loamy soils

This map unit makes up about 15 percent of the county. It is made up of about 34 percent Falba soils, 15 percent Burlewash soils, and 51 percent soils of minor extent (fig. 5). Slopes are 1 to 20 percent.

Falba soils have a surface layer of light gray, medium acid fine sandy loam 4 inches thick. The surface layer is over gray, strongly acid clay that extends to a depth of 24 inches. The underlying layer is strongly acid, tuffaceous clay.

Burlewash soils have a surface layer of light brownish gray fine sandy loam about 6 inches thick. The subsoil is 27 inches thick. It is brown clay that grades to clay loam in the lower part. The underlying layer is cemented tuffaceous sandstone. These soils are very strongly acid.

Minor soils in this unit are Koether, Arol, Kaufman, Nahatche, Rehburg, and Shalba soils. The Koether soil is on the upper slopes. The Rehburg and Arol soils are on small hills and ridges. The Shalba soil is on low ridges. The Nahatche and Kaufman soils are on bottom lands.

This unit is used mainly for improved pasture and rangeland.

These soils have low potential for crops, because they are low in natural fertility, have a low available water capacity, and are very slowly permeable. These soils have medium potential for improved pasture. They are limited by low natural fertility. Lime is needed for most crops and grasses in pasture.

These soils have low potential for urban and recreational development. Very slow permeability, depth to rock, and slope are limitations.

8. Lufkin-Mabank

Deep, nearly level and gently sloping, strongly acid and medium acid, loamy soils

This map unit makes up about 3 percent of the county. It is made up of about 50 percent Lufkin soils, 35 percent Mabank soils, and 15 percent soils of minor extent. Slopes are 0 to 5 percent.

Lufkin soils have a grayish brown, strongly acid

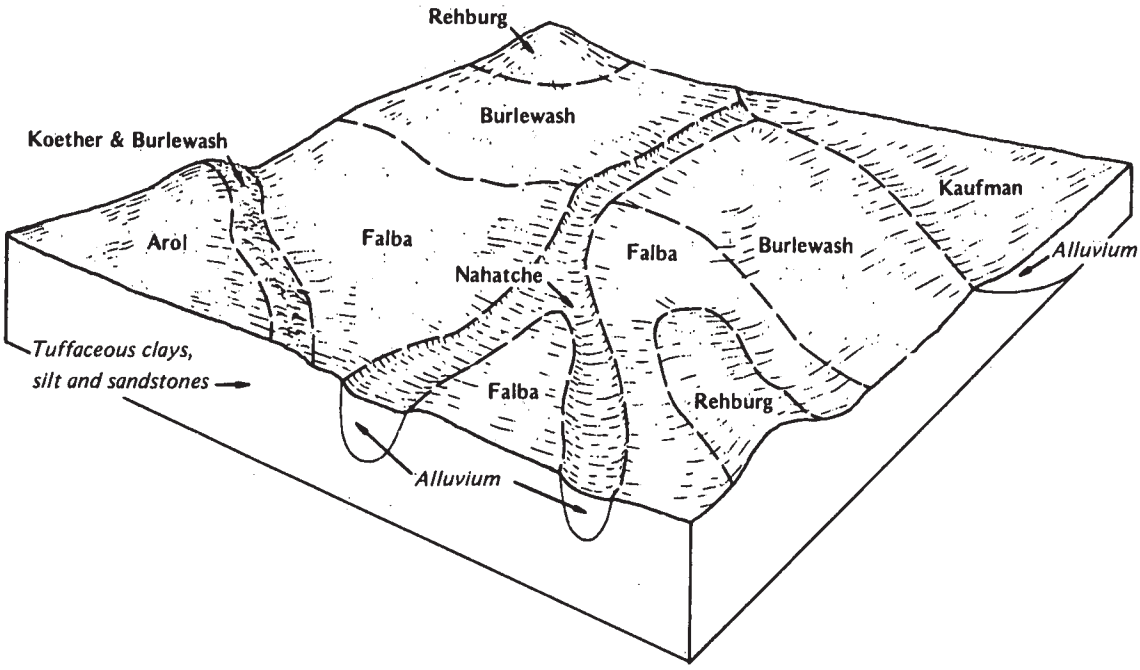


Figure 5.—The Falba-Burlewash General Soil Map Unit.

surface layer of fine sandy loam about 8 inches thick. The subsoil is gray to grayish brown, slightly acid clay to a depth of 48 inches and is light gray, moderately alkakine sandy clay loam to a depth of 80 inches.

Mabank soils have a surface layer of gray, medium acid fine sandy loam 8 inches thick. The subsoil is dark gray, medium acid to neutral clay that extends to a depth of 60 inches or more.

Minor soils in this unit are Axtell and Wilson soils. The Axtell soil is on sloping parts of the landscape. Wilson soil is on foot slopes and in slight depressions adjacent to the Mabank soil.

This map unit is used mainly for pasture and rangeland.

The soils have medium potential for crops and pasture. Low fertility, very slow permeability, and low available water capacity are the main limitations.

The soils have low potential for urban and recreational uses. Shrink-swell properties, very slow permeability, and wetness are limitations.

Well drained and somewhat poorly drained, clayey and loamy soils; on bottom lands

The soils in this group make up about 19 percent of the county. The major soils are of the Bosque, Trinity, Brazoria, Kaufman, and Gowen series. They are nearly level and on flood plains and low terraces. The soils have a loamy or clayey surface layer and loamy or clayey underlying material.

The soils are used mainly for pasture and crops. Some areas are used for production of pecans. Improved bermudagrass and kleingrass are the principal grasses used for pasture.

9. Bosque-Trinity

Deep, nearly level, moderately alkaline, loamy and clayey soils

This map unit makes up about 10 percent of the county. It is made up of about 40 percent Bosque soils, 40 percent Trinity soils, and 20 percent soils of minor extent. Slopes are 0 to 1 percent.

Bosque soils have a surface layer of dark gray clay loam about 22 inches thick. The subsoil is brownish loam to a depth of 40 inches. The underlying layer is dark gray clay loam to a depth of 60 inches. These soils are calcareous and moderately alkaline throughout.

Trinity soils have a surface layer of dark gray, moderately alkaline clay about 39 inches thick. From 39 to 80 inches is very dark gray clay. These soils are calcareous and moderately alkaline throughout.

Minor in this unit is the Kaufman soil. The Kaufman soil is in and along sloughs.

This map unit is used mainly for improved pasture and production of pecans.

These soils have high potential for crops if flooding is controlled. They have high potential for improved pasture. They are well suited to improved bermudagrass and kleingrass.

These soils have low potential for urban and recreational uses. Flooding, shrink-swell properties, and very slow permeability are the main limitations.

10. Brazoria

Deep, nearly level, moderately alkaline, clayey soils

This map unit makes up about 7 percent of the county. It is made up of about 45 percent Brazoria soils and 55 percent soils of minor extent. Slopes are dominantly 0 to 1 percent.

Brazoria soils are a calcareous, moderately alkaline clay to a depth of 60 inches. Color ranges from brown to gray.

Minor soils in this unit are Asa, Belk, Clemville, Kiomatia, Norwood, and Oklared soils. The Asa, Clemville, and Norwood soils are in slightly higher positions on the landscape. The Kiomatia soil is adjacent to the stream channel. The Oklared soil is near the stream channels.

This map unit is used for crops and improved pasture.

The soils have high potential for crops. Some areas have not been farmed because of inaccessibility. These soils have high potential for improved pasture. They are well suited to improved bermudagrasses, such as Coastal bermudagrass.

The soils have low potential for urban and recreational development. Flooding is the limitation.

11. Kaufman-Gowen

Deep, nearly level, mildly alkaline and neutral, clayey and loamy soils

This map unit makes up about 2 percent of the county. It is made up of about 50 percent Kaufman soils, 30 percent Gowen soils, and 20 percent soils of minor extent. Slopes are 0 to 1 percent.

Kaufman soils have a surface layer of very dark gray clay about 8 inches thick. Below this is dark gray, mildly alkaline clay to a depth of 60 inches.

Gowen soils have a surface layer of neutral, very dark grayish brown clay loam about 10 inches thick. From 10 to 24 inches is moderately alkaline, very dark gray clay loam. Below this is moderately alkaline, grayish brown clay loam.

Minor soils in this unit are primarily of the Nahatche, Bosque, and Trinity series.

The soils of this map unit are used mainly for improved pasture.

These soils have high potential for crops if flooding is controlled. They have high potential for improved pasture. They are well suited to improved bermudagrass and kleingrass.

These soils have low potential for urban and recreational uses. Flooding, shrink-swell properties, and very slow permeability are the main limitations.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Tabor fine sandy loam, 1 to 5 percent slopes, is one of several phases in the Tabor series.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Oklared-Norwood complex, occasionally flooded, is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. The Burlewash-Koether Association, steep, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Kiomatia and Norwood soils, frequently flooded, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

1—Arol fine sandy loam, 1 to 5 percent slopes. This moderately deep, gently sloping soil is on uplands. Individual areas are irregularly shaped and range from 30 to 200 acres.

Typically, the surface layer is light brownish gray, medium acid fine sandy loam about 8 inches thick. The subsoil from 8 to 32 inches is very dark gray, slightly acid clay. The underlying layer from 32 to 40 inches is light gray, strongly acid, tuffaceous clay.

This soil is somewhat poorly drained. Runoff is slow. Permeability is very slow. Natural fertility and organic matter content are low. Available water capacity is low. The hazard of water erosion is severe. The layer of tuffaceous clay is largely impervious to roots. During periods of extended rainfall, a perched water table saturates the surface layer.

Included in some mapped areas of this soil are small amounts of Falba, Burlewash, Mabank, and Greenvine soils. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly as rangeland or improved pasture.

The soil has low potential for crops. It has high potential for pasture production, but it needs good management and proper fertilization. Improved bermudagrass, bahiagrass, and kleingrass are well suited to this soil.

This soil has low potential for most urban and recreational development. Shrink-swell properties, moderate depth, and very slow permeability are limitations.

This soil is in capability subclass IVe and the Claypan Savannah range site.

2—Asa silt loam, 0 to 1 percent slopes. This deep, nearly level soil is on bottom lands. Individual areas are irregularly shaped but generally are somewhat elongated. They are 100 to 200 acres. These soils are rarely flooded.

Typically, the surface layer is silt loam about 19 inches thick. It is brown in the upper part and dark reddish gray in the lower part. The upper part of the subsoil from 19 to 28 inches is reddish brown silt loam. The lower part of the subsoil from 28 to 49 inches is yellowish red loam. The underlying material extends to a depth of 80 inches. It is reddish yellow silt loam in the upper part and yellowish red silty clay loam in the lower part.

Typically, the soil is calcareous and moderately alkaline throughout. Natural fertility and organic matter content are high. Available water capacity is medium. Water erosion is slight.

Included in some mapped areas of this soil are small amounts of a soil which is similar to the Asa soil but which has a dark surface layer more than 20 inches thick. Also included are small areas of a similar soil that is less clayey throughout and another similar soil that has a surface layer of silty clay loam, clay loam, or silty clay. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly for crops and pasture.

The potential for crops and pasture production is high. This soil is well suited to improved bermudagrass, bahiagrass, kleingrass, cotton, grain sorghum, corn, and small grains. It is an excellent soil for pecans.

Flooding is a limitation for both urban and recreational development.

This soil is in capability class I and the Loamy Bottomland range site.

3—Axtell fine sandy loam, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are irregularly shaped to elongated and are 40 to 80 acres.

Typically, the surface layer is brown, slightly acid fine sandy loam about 6 inches thick. The upper part of the subsoil from 6 to 30 inches is a yellowish red, strongly acid clay that has gray mottles. From 30 to 46 inches is a mottled red, yellowish red, and pale brown clay loam that is slightly acid. The lower part of the subsoil from 46 to 62 inches is mottled light yellowish brown and light gray, moderately alkaline sandy clay loam.

This soil is moderately well drained. Runoff is slow. Permeability is very slow. Natural fertility and organic matter content are low. Available water capacity is medium. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small amounts of Crockett, Chazos, and Tabor soils. Also included are small areas of Axtell fine sandy loam, 5 to 12 percent slopes. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly as pasture.

The soil has low potential for crops. It has high potential for forage production, but additions of lime and fertilizer are needed. In most areas native vegetation is a dense stand of post oak and associated trees and shrubs. Improved bermudagrass is well suited to this soil.

This soil has low potential for most urban and recreational development. Limitations are shrink-swell properties and very slow permeability. Low strength is also a limitation for roads and streets.

This soil is in capability subclass IVe and the Claypan Savannah range site.

4—Axtell fine sandy loam, 5 to 12 percent slopes. This deep, sloping and strongly sloping soil is on uplands. Individual areas are irregularly shaped to elongated and are 20 to 50 acres.

Typically, the surface layer is slightly acid fine sandy loam about 9 inches thick. It is brown in the upper part and pale brown in the lower part. The upper part of the subsoil to 50 inches is reddish yellow, strongly acid clay that has gray mottles. The lower part of the subsoil from 50 to 65 inches is mottled light yellowish brown and grayish brown and grayish brown, strongly acid sandy clay loam.

This soil is moderately well drained. Runoff is slow. Permeability is very slow. Natural fertility and organic matter content are low. Available water capacity is medium. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small amounts of Crockett, Tabor, and Chazos soils and of Axtell fine sandy loam, 1 to 5 percent slopes. Included soils make up less than 15 percent of any mapped area.

This soil is used dominantly as pasture.

This soil is not suited to crops because of slopes. It has high potential for forage production, but it needs proper management, which includes additions of lime and fertilizer. In most areas native vegetation is a dense stand of post oak and associated trees and shrubs. Improved bermudagrass is well suited to this soil.

This soil has low potential for most urban and recreational development. Limitations are shrink-swell properties and very slow permeability. Low strength is also a limitation for roads and streets.

This soil is in capability subclass VIe and the Claypan Savannah range site.

5—Belk clay, 0 to 1 percent slopes. This deep, nearly level soil is on bottom lands. Individual areas are elongated and are 50 to 125 acres. This soil is rarely flooded.

Typically, the surface layer is reddish brown clay about 25 inches thick. From 25 to 62 inches is dark brown silt loam. This soil is calcareous and moderately alkaline throughout.

This soil is well drained. Runoff is slow. Permeability is very slow. Natural fertility is high and organic matter content is medium. Available water capacity is high. The hazard of water erosion is slight.

Included in some mapped areas of this soil are small areas of Brazoria, Clemville, Norwood, and Trinity soils. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly for crops.

This soil has high potential for crop production, but it needs proper management, which includes additions of fertilizer. This soil is well suited to grain sorghum and cotton. It is also well suited to bahiagrass and kleingrass pasture.

This soil has low potential for most urban and recreational development. Flooding and very slow permeability are limitations for both.

This soil is in capability subclass IIIs and the Clayey Bottomland range site.

6—Bleiblerville clay, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are irregularly shaped and are 20 to 200 acres in size.

Typically, the surface layer is very dark gray clay about 33 inches thick. From 33 to 63 inches is dark gray clay. The underlying layer from 63 to 75 inches is pale yellow clay mottled with dark gray. This soil is calcareous and moderately alkaline throughout.

This soil is moderately well drained. Runoff is medium. Permeability is very slow. Natural fertility and organic matter content are high. Available water capacity is high. The hazard of water erosion is moderate.

Included in some mapped areas of this soil are small amounts of Frelsburg, Latium, and Brenham soils and of Bleiblerville clay, 0 to 1 percent slopes. Included soils make up less than 20 percent of a mapped area.

This soil is used dominantly as rangeland and improved pasture (fig. 6). Some areas are used for corn and grain sorghum, and some are used for native grass hay (fig. 7). Most areas of this soil have been cultivated at one time or another.

The soil has high potential for forage or crop production, but it needs proper management and additions of fertilizer. The main suited crops are cotton, corn, and grain sorghum.

This soil has low potential for most urban and recreational development. Shrink-swell properties and very slow permeability are limitations, and low strength is also a limitation for roads and streets.

This soil is in capability subclass IIe and the Blackland range site.

7—Bleiblerville clay, 3 to 5 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are irregularly shaped and are 15 to 125 acres.

Typically, the surface layer is black clay about 15 inches thick. From 15 to 62 inches is dark gray clay. The underlying layer from 62 to 73 is mottled gray and olive clay. The soil is calcareous and moderately alkaline throughout.

This soil is moderately well drained. Runoff is medium. Permeability is very slow. Natural fertility and organic matter content are high. Available water capacity is high. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small amounts of Frelsburg, Latium, and Brenham soils. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly for native or improved pasture.

The soil has medium potential for crops. The main crops are cotton, corn, and grain sorghum. This soil has high potential for pasture production, but it needs proper management, which includes additions of fertilizer.

This soil has low potential for most urban and recreational development. Shrink-swell properties, very slow permeability, and, for roads and streets, low strength are limitations.

The soil is in capability subclass IIIe and the Blackland range site.

8—Bosque clay loam, frequently flooded. This deep, nearly level soil is on bottom lands. Slopes are 0 to 1 percent. Individual areas are elongated and are 70 to 300 acres.

Typically, the surface layer is dark gray clay loam about 22 inches thick. From 22 to 40 inches is mottled grayish brown and pale brown loam. The underlying layer from 40 to 62 inches is dark gray clay loam. This soil is calcareous and moderately alkaline throughout.

This soil is well drained. Runoff is slow to medium. Permeability is moderate. Natural fertility and organic matter content are high. Available water capacity is high. This soil floods briefly 1 to 3 times each year. The hazard of water erosion is slight.

Included in some areas of this soil are small areas of Gowen and Nahatche soils. Included soils make up less than 20 percent of a mapped area.

Areas of this soil that have sparse to dense stands of pecan, elm, or hackberry trees are used dominantly for native or improved pasture. A few of the higher areas are cultivated.

This soil has high potential for forage production, but it needs good management and proper fertilization. It has low potential for crops because of the hazard of flooding.

Figure 6.—An area of Bleiblerville clay, 1 to 3 percent slopes, in rangeland. This soil is in the Blackland range site.

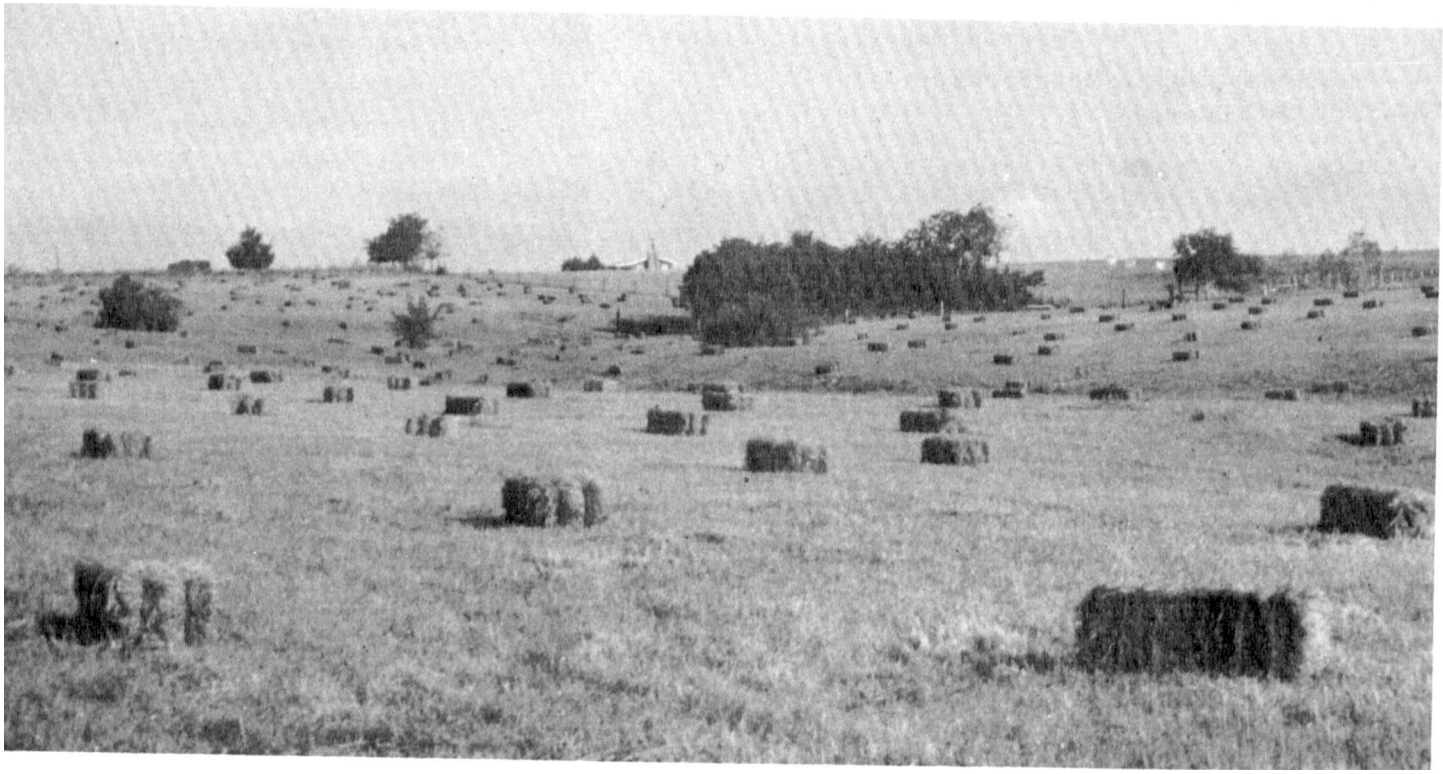


Figure 7.—An area of Bleiblerville clay, 1 to 3 percent slopes, in meadow of native grasses.

Flooding is a limitation for both urban and recreational development.

This soil is in capability subclass Vw and the Loamy Bottomland range site.

9—Brazoria clay, 0 to 1 percent slopes. This deep, nearly level soil is on bottom lands. Individual areas vary in shape and are 50 to 900 acres in size. These soils are rarely flooded.

Typically, the surface layer is brown clay about 3 inches thick. From 3 to 15 inches is dark reddish gray clay. The upper part of the subsoil from 15 to 44 inches is reddish brown clay. The lower part of the subsoil from 44 to 80 inches is dark gray clay. This soil is calcareous and moderately alkaline throughout.

This soil is somewhat poorly drained. Runoff is slow. Permeability is very slow. Natural fertility is high, and organic matter content is medium. Available water capacity is high. The hazard of water erosion is slight.

Included in mapped areas of this soil are small amounts of Clemville and Trinity soils and a soil which is similar to this Brazoria soil but which is loamy in the lower part of the subsoil. Included soils make up less than 15 percent of any mapped area.

This soil is used dominantly for crops.

This soil has high potential for crop production and improved pasture. This soil is well suited to grain sorghum and cotton and improved bermudagrass and kleingrass.

Flooding, shrink-swell properties, and very slow permeability are limitations for both recreational and urban development.

This soil is in capability subclass IIe and the Clayey Bottomland range site.

10—Brazoria clay, 1 to 3 percent slopes. This deep, gently sloping soil is on bottom lands. Individual areas are long and narrow and 20 to 100 acres. These soils are rarely flooded.

Typically, the surface layer is dark brown clay about 14 inches thick. From 14 to 50 inches is reddish brown clay. The underlying layer from 50 to 72 inches is dark reddish brown clay mottled with dark brown and reddish brown. This soil is calcareous and moderately alkaline throughout.

This soil is somewhat poorly drained. Runoff is slow Permeability is very slow. Natural fertility is high, and organic matter content is medium. Available water capacity is high. The hazard of water erosion is slight.

Included in some mapped areas of this soil are small amounts of Belk, Clemville, and Trinity soils. Also included is a soil which is similar to this Brazoria soil but which is loamy in the lower part of the subsoil. The included soils make up as much as 15 percent of some mapped areas.

This soil is used dominantly for crops.

This soil has high potential for crop production and improved pasture. It is well suited to grain sorghum and cotton and improved bermudagrass and kleingrass.

Flooding, shrink-swell properties, and very slow permeability are limitations for both recreational and urban development.

This soil is in capability subclass IIw and the Clayey Bottomland range site.

11—Brenham clay loam, 3 to 8 percent slopes. This deep, gently sloping and sloping soil is on uplands. Individual areas are 50 to 130 acres.

Typically, the surface layer is dark grayish brown clay loam about 10 inches thick. From 10 to 48 inches is pale yellow silty clay loam and carbonates that increase to about 50 percent in the lower part. The underlying layer from 48 to 61 inches is yellow clay. The soil is calcareous and moderately alkaline.

This soil is well drained. Runoff is rapid. Permeability is moderately slow. Natural fertility is high, and organic matter content is medium. Available water capacity is high. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small amounts of Frelsburg, Carbengle, and Latium soils. Included soils make up less than 15 percent of any mapped area.

This soil is used dominantly for native pasture.

The soil has medium potential for crops. The main crop is corn. The soil has high potential for improved pasture. Little bluestem, Indiangrass, and sideoats grama, as well as improved bermudagrasses and kleingrass, are well suited to this soil.

This soil has low potential for most urban and recreational development. Shrink-swell properties and moderately slow permeability are limitations for these uses.

This soil is in capability subclass IVe and the Clay Loam range site.

12—Burleson clay, 0 to 1 percent slopes. This deep, nearly level soil is on ancient stream terraces. Individual areas are rounded to oblong and are 30 to 200 acres.

Typically, the surface layer is dark gray clay about 8 inches thick. From 8 to 42 inches is very dark gray clay. From 42 to 60 inches is a gray clay, and from 60 to 70 inches is light yellowish brown clay. The soil is neutral in the upper 42 inches, and it is calcareous and moderately alkaline in the lower part.

This soil is moderately well drained. Runoff is slow. Permeability is very slow. Natural fertility and organic matter content are high.

Included in some mapped areas of this soil are small amounts of Trinity soils and a soil which is similar to the Burleson soil but which is calcareous in the upper horizons. Included soils make up less than 10 percent of a mapped area.

This soil is used dominantly for pasture. A small acreage is in crops.

The soil has high potential for forage and crop production. It is well suited to improved bermudagrasses, bahiagrass, kleingrass, corn, and small grains.

This soil has low potential for most urban and recreational development. Shrink-swell properties and very slow permeability are limitations.

This soil is in capability subclass IIw and the Blackland range site.

13—Burleson clay, 1 to 3 percent slopes. This deep, gently sloping soil is on ancient stream terraces. Individual areas are rounded or oval and are 10 to 50 acres.

Typically, the surface layer is very dark gray clay about 3 inches thick. Between 3 and 46 inches is dark gray clay. The underlying layer from 46 to 72 inches is reddish yellow clay. The soil is neutral in the upper part, and it is moderately alkaline and calcareous in the lower part.

This soil is moderately well drained. Runoff is medium. Permeability is very slow. Natural fertility, organic matter content, and available water capacity are high. The hazard of water erosion is slight.

Included in some mapped areas of this soil are small amounts of Wilson soils and a soil which is similar to this Burleson soil but which is calcareous in the upper part. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly as pasture and rangeland.

The soil has high potential for forage production. It is well suited to improved bermudagrasses, kleingrass, and bahiagrass. It has high potential for crops. The main crops are corn, cotton, and grain sorghum.

This soil has low potential for most urban and recreational development. Shrink-swell properties and very slow permeability are limitations.

This soil is in capability subclass IIe and the Blackland range site.

14—Burlewash fine sandy loam, 1 to 5 percent slopes. This moderately deep, gently sloping soil is on uplands. Individual areas are oval to somewhat elongated and are 50 to 300 acres.

Typically, the surface layer is light brownish gray fine sandy loam about 6 inches thick. The upper part of the subsoil from 6 to 21 inches is brown clay. The lower part of the subsoil from 21 to 27 inches is brown clay loam that has very pale brown mottles. The underlying layer from 27 to 40 inches is stratified, slightly cemented, white clay and sandy loam. The soil is typically very strongly acid throughout.

This soil is well drained. Runoff is medium. Permeability is very slow. Natural fertility, organic matter content, and available water capacity are low. The hazard of water erosion is severe. The underlying layer is largely impervious to roots.

Included in some mapped areas of this soil are small amounts of Arol, Falba, and Rehburg soils and a soil which is similar to the Burlewash soil but which is more than 40 inches deep to the cemented layer. Included soils make up less than 15 percent of any mapped area.

This soil is used dominantly as pasture and rangeland.

This soil has high potential for forage production, but it needs good management and additions of lime and the proper fertilizer. Improved bermudagrass and bahiagrass are well suited to this soil. This soil has low potential for crops.

This soil has low potential for most urban and recreational development because shrink-swell properties, moderate depth, and very slow permeability are limitations.

This soil is in capability subclass IVe and the Claypan Savannah range site.

15—Burlewash fine sandy loam, 5 to 20 percent slopes. This moderately deep, sloping to moderately steep soil is on uplands. Individual areas are elongated and lie along breaks above streams. Areas are 20 to 80 acres.

Typically, the surface layer is dark grayish brown fine sandy loam about 8 inches thick. The subsoil from 8 to 28 inches is brown clay. The underlying layer from 28 to 38 inches is pale brown, stratified clay and slightly cemented sandstone. The soil is typically very strongly acid throughout.

This soil is well drained. Runoff is medium to rapid. Permeability is very slow. Natural fertility, organic matter content, and available water capacity are low. The hazard of water erosion is severe. The underlying layer is largely impervious to roots.

Included in some mapped areas of this soil are small amounts of two soils that are similar to the Burlewash soil except one is shallower to sandstone and the other has a loamy subsoil. Small spots and patches of rock outcrop occur. Included soils make up less than 15 percent of a mapped area.

This soil is dominantly used as pasture and rangeland.

This soil has medium potential for forage production, but it needs good management and additions of lime and proper fertilizer. Improved bermudagrass and bahiagrass are well suited to this soil. This soil is not suited to crops because of slope.

The soil has low potential for most urban and recreational development because shrink-swell properties, moderate depth, and slope are limitations.

This soil is in capability subclass VIe and the Claypan Savannah range site.

16—Burlewash-Gullied land complex, 5 to 20 percent slopes. This complex consists of moderately deep soils and areas of gullies (fig. 8). Individual areas are elongated and 10 to 30 acres.

The Burlewash soil makes up about 23 percent of the

Figure 8.—An area of Burlewash-Gullied complex, 5 to 20 percent slopes.

area, Gullied land makes up about 72 percent, and other soils make up about 5 percent. The gullies are mostly 6 to 12 feet deep. The depth of the gullies depends mainly on the resistance of the substratum to erosion. The gully banks are nearly vertical. The gullies are 5 to 20 feet wide and a few feet to about 200 feet apart. The Burlewash soil between gullies is largely not affected by erosion, and most of the surface layer remains. These soils and Gullied land are so intricately mixed that separation is not practical at the scale mapped.

Typically, the Burlewash soil has a surface layer of light brownish gray fine sandy loam about 3 inches thick. From 3 to 33 inches is brown clay. The underlying layer from 33 to 45 inches is tuffaceous clay and sandstone. The soil is very strongly acid throughout. It is well drained. Runoff is medium. Permeability is very slow.

This complex is not suited to cultivation because of the gullies, which cannot be crossed with farm equipment. Most areas have been cultivated in the past. Most gullies formed more than 40 years ago. They are not presently extending because erosion has moved the head of the gully to the top of the hill or has cut down to resistant rock.

Reclamation of these areas is difficult because there is not enough deep soil to use as a source of backfill. Revegetation using ground cover plants is possible.

The soil has low urban and recreational potential because of erosion and very slow permeability.

This complex is in capability subclass VIIe and the Claypan Savannah range site.

17—Burlewash-Koether association, steep. This association consists of moderately deep, shallow, and very shallow soils that are gently sloping to very steep. These soils are on uplands. Slopes range from 1 percent to more than 50 percent. Mapped areas are long and narrow and are 50 to 200 acres. The Koether soils are on the upper slopes and secondary breaks of the middle slopes. The Burlewash soils are primarily on the lower, concave slopes.

The Burlewash soils make up 30 percent of the association, and Koether soils make up 26 percent. A soil which is similar to the Burlewash soil but which has a subsoil of sandy clay loam makes up about 20 percent of the association. The composition of this association is more variable than that of other map units in the county. These soils have been mapped together because their use and management are similar.

Typically, the surface layer of the Burlewash soil is light brownish gray fine sandy loam about 8 inches thick. The subsoil from 8 to 23 inches is brown clay. The underlying layer from 23 to 40 inches is stratified clay and white sandstone. The soil is typically very strongly acid throughout.

The Burlewash soil is well drained. Runoff is medium. Permeability is very slow.

Typically, the surface layer of the Koether soil is light brownish gray stony loamy sand about 16 inches thick. The underlying material is strongly cemented sandstone. The soil is typically very strongly acid throughout.

The Koether soil is somewhat excessively drained. Runoff is rapid. Permeability is rapid; however, the sandstone is impervious except for the cracks and fissures.

Other soils in this association are small amounts of Falba, Shalba, and Rehburg soils.

These soils are used as rangeland and for wildlife habitat.

The soils are not suited to cultivation because of steep slopes, shallow depths, and stones. In most areas vegetation is post oak, blackjack oak, yaupon, and bluestem grass.

These soils have low potential for urban and recreational development because of slopes, stones, and very slow permeability. The esthetic value of these areas is high because of the scenic views created by the steep and broken landscape.

These soils are in capability subclass VIIs and Claypan Savannah range site.

18—Carbengle clay loam, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on uplands. Individual areas are long and narrow and range from 15 to 60 acres.

Typically, the surface layer is very dark gray loam about 12 inches thick. The subsoil from 12 to 29 inches is pale brown silty clay loam that contains 50 percent carbonates. The underlying layer from 29 to 35 inches is white, slightly cemented sandstone. The soil is moderately alkaline and calcareous throughout.

The soil is well drained. Permeability is moderate. Available water capacity is low. Surface runoff is medium. Natural fertility is medium, and organic matter content is high. The hazard of erosion is moderate. The soil is easy to work because it has good drainage and permeability.

Included in some mapped areas of this soil are small amounts of Brenham and Renish soils. The Brenham soil is on the broader ridgetops. The Renish soil is on the upper slopes of hills. A soil which is similar to Carbengle soil but which is calcareous fine sandy loam and is on crests of hills are included. Included soils make up about 15 percent of mapped areas.

This soil is used mainly for pasture. Some mesquite, elm, ash, and hackberry trees are in these areas. Most areas have been cultivated in the past.

This soil has high potential for pasture. It is adapted to bermudagrass and kleingrass. It has medium potential for crops; however, terraces and grassed waterways are necessary to reduce erosion.

The soil has medium potential for most urban and recreational uses. The moderate depth to sandstone and high lime content are limitations.

This soil is in capability subclass IIe and the Clay Loam range site.

19—Carbengle clay loam, 3 to 5 percent slopes. This moderately deep, gently sloping soil is on uplands. Individual areas are long and narrow and range from 20 to 80 acres.

Typically, the surface layer is very dark gray clay loam about 12 inches thick. The subsoil from 12 to 34 inches is clay loam that is light gray in the upper part and white in the lower part and contains 50 percent carbonates. The underlying layer from 34 to 60 inches is a white, slightly cemented sandstone. The soil is moderately alkaline and calcareous throughout.

This soil is well drained. Runoff is medium. Permeability is moderate. Natural fertility and organic matter content are medium. Available water capacity is low. The hazard of water erosion is moderate.

Included in mapped areas of this soil are small amounts of Klump, Knolle, and Renish soils and a soil that is dark, calcareous fine sandy loam throughout. Also included are two soils that are similar to the Carbengle soil except one has a lighter colored surface layer and one has sandstone at a depth of 40 to 60 inches. Included soils make up about 15 percent of mapped areas.

This soil is used for pasture of improved bermudagrass or for rangeland. Most of these soils have been cultivated in the past.

This soil has high potential for forage production. It is well suited to improved bermudagrasses and kleingrass. It has medium potential for crops. Closely spaced crops, terracing, and grassed waterways are necessary to control erosion.

This soil has medium potential for urban and recreational use because of depth to rock and low strength, which affects roads and streets.

The soil is in capability subclass IIIe and the Clay Loam range site.

20—Carbengle clay loam, 5 to 8 percent slopes. This moderately deep, gently rolling soil is on uplands. Individual areas are long and narrow and range from 30 to 90 acres.

Typically, the surface layer is brown clay loam about 12 inches thick. The subsoil from 12 to 36 inches is yellowish brown clay loam that contains 50 percent carbonates. From 36 to 48 inches is white, slightly cemented sandstone. The soil is moderately alkaline and calcareous throughout.

This soil is well drained. Runoff is medium. Permeability is moderate. Natural fertility and organic

matter content are medium. Available water capacity is low. The hazard of water erosion is moderate.

Included in some mapped areas of this soil are small amounts of Klump and Renish soils. Also included are three soils that are similar to the Carbengle soil except one has a light colored surface layer, one is fine sandy loam throughout, and one has sandstone at a depth of 40 to 60 inches. Included soils make up less than 15 percent of each mapped area.

This soil is used mainly for pasture. Most areas have been cultivated in the past.

This soil has high potential for forage production. It is adapted to improved bermudagrass, kleingrass, and native grasses.

The soil has medium potential for crops. Closely spaced crops, terracing, and grassed waterways are necessary to protect this soil from erosion.

This soil has medium potential for urban and recreational use because of the depth to rock and low strength, which affects roads and streets.

This soil is in capability subclass IVe and the Clay Loam range site.

21—Chazos loamy fine sandy, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are 20 to 80 acres.

Typically, the surface layer is medium acid loamy fine sand about 12 inches thick. It is grayish brown in the upper part and pale brown in the lower part. From 12 to 21 inches the subsoil is mottled red and gray, neutral sandy clay loam. From 62 to 75 inches is white, calcareous, moderately alkaline clay.

This soil is moderately well drained. Runoff is slow to medium. Permeability is slow. Natural fertility and organic matter content are low. Available water capacity is medium. The hazard of water erosion is moderate.

Included in some mapped areas of this soil are small amounts of a soil which is similar to this Chazos soil but which has a thinner surface layer and small amounts of Axtell, Silawa, and Tremona soils. Also small areas of Chazos loamy fine sand, 5 to 8 percent slopes, are included. Included soils make up less than 15 percent of any area.

This soil is used dominantly for pasture and rangeland.

This soil has high potential for forage production, but it needs good management and additions of proper fertilizer. Improved bermudagrasses, kleingrass, and bahiagrass are well suited to this soil. Many areas support a dense stand of post oak and associated trees and shrubs. The potential for crops is medium.

This soil has medium potential for most urban and recreational development. The shrink-swell property is the main limitation.

This soil is in capability subclass IIIe and the Loamy Sand range site.

22—Chazos loamy fine sand, 5 to 8 percent slopes. This deep, sloping soil is on uplands. Individual areas are 20 to 40 acres.

Typically, the surface layer is loamy fine sand about 11 inches thick. It is dark yellowish brown in the upper part and yellowish brown in the lower part. The upper part of the subsoil from 11 to 33 inches is strongly acid sandy clay mottled with reds, browns, and grays. The lower part of the subsoil from 33 to 57 inches is mottled red and gray, neutral sandy clay loam. The underlying layer from 57 to 65 inches is white and light gray, calcareous, moderately alkaline clay.

This soil is moderately well drained. Runoff is slow to medium. Permeability is slow. Natural fertility and organic matter content are low. Available water capacity is medium. The hazard of water erosion is moderate.

Included in some mapped areas of this soil are small amounts of Axtell and Tremona soils and a soil which is similar to this Chazos soil but which has a thinner surface layer. Also small amounts of Chazos loamy fine sand, 1 to 5 percent slopes, are included. Included soils make up as much as 15 percent of a mapped area.

This soil is used dominantly for pasture and as rangeland.

This soil has high potential for forage production, but it needs good management and additions of the proper fertilizer. It is well suited to improved bermudagrasses, bahiagrass, and kleingrass. In many areas native vegetation is a dense stand of post oak and associated trees and shrubs. This soil has low potential for crops because of slope.

This soil has moderate potential for most urban and recreational development. Shrink-swell properties and slope are the limitations.

The soil is in capability subclass IVe and the Loamy Sand range site.

23—Clemville silt loam, 0 to 1 percent slopes. This deep, nearly level soil is on bottom lands. This soil is rarely flooded. Individual areas are irregularly shaped and are 50 to 200 acres.

Typically, the surface layer is brown silt loam about 6 inches thick. From 6 to 15 inches is reddish brown silt loam. From 15 to 28 inches is silty clay loam that is light brown in the upper part and reddish brown in the lower part. From 28 to 65 inches is reddish brown clay. The soil is typically calcareous and moderately alkaline throughout.

This soil is well drained. Runoff is slow. Permeability is slow. Natural fertility and available water capacity are high. The hazard of water erosion is slight.

Included in some mapped areas of this soil are small amounts of Asa, Belk, Brazoria, and Norwood soils and a soil which is similar to the Clemville soil but which is clayey from below the surface layer to a depth of more than 40 inches. Included soils make up less than 20 percent of any mapped area.

This soil is used dominantly for crops.

This soil has high potential for crop production, but it needs good management and additions of proper

fertilizer. Grain sorghum, corn, and cotton are well suited to this soil. The soil has high potential for pasture. Some areas are in native grasses, and others are in bermudagrass and kleingrass.

This soil has low potential for most urban and recreational development. Flooding is the limitation for both uses.

This soil is in capability class I and the Loamy Bottomland range site.

24—Clemville silt loam, 1 to 3 percent slopes. This deep, gently sloping soil is on bottom lands. It is rarely flooded. Individual areas are irregularly shaped and are 20 to 60 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. From 8 to 28 inches is reddish brown silt loam. From 28 to 63 inches is reddish brown silty clay. The underlying layer from 63 to 75 inches is reddish yellow silt loam and strata of yellowish red silty clay. The soil is typically calcareous and moderately alkaline throughout.

This soil is well drained. Runoff is slow. Permeability is slow. Natural fertility and available water capacity are high. The hazard of water erosion is slight.

Included in some mapped areas of this soil are small amounts of Asa, Belk, Brazoria, and Norwood soils and a soil which is similar to the Clemville soil but which is clayey below the surface layer. Also included are areas of Clemville silt loam that has 3 to 5 percent slopes. Included soils make up as much as 20 percent of a mapped area.

This soil is used dominantly for crops.

This soil has high potential for crop production, but it needs good management and additions of proper fertilizer. Grain sorghum, corn, and cotton are well suited to this soil. The soil has high potential for pasture. Some areas are in native grass, and others are in improved bermudagrass and kleingrass.

This soil has low potential for most urban and recreational development. Flooding is the main limitation for both uses.

The soil is in capability subclass IIe and the Loamy Bottomland range site.

25—Crockett fine sandy loam, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are irregularly shaped and are 15 to 50 acres.

Typically, the surface layer is light brownish gray, medium acid fine sandy loam about 7 inches thick. The upper part of the subsoil from 7 to 14 inches is light brownish gray, slightly acid clay that has red mottles. From 14 to 26 inches is light yellowish brown, neutral clay that has yellowish brown mottles. From 26 to 51 inches is brown, mildly alkaline clay mottled with yellowish brown. The lower part of the subsoil from 51 to 80 inches is brownish yellow, moderately alkaline sandy clay mottled with red and strong brown.

This soil is moderately well drained. Runoff is slow to medium. Permeability is very slow. Natural fertility and organic matter content are low. Available water capacity is high. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small amounts of Mabank, Wilson, and Axtell soils. Also included are small amounts of Crockett fine sandy loam that has 0 to 1 percent slopes, and some small washes and shallow rills. Included soils make up as much as 15 percent of a mapped area.

This soil is used for pasture; however, most of it has been cultivated in the past.

This soil is well suited to improved bermudagrass, kleingrass, and bahiagrass. Mesquite and huisache trees have invaded some of the areas. High production of forage can be produced, but the soil needs good management and additions of proper fertilizer. This soil has low potential for crops.

This soil has low potential for most urban and recreational development. Shrink-swell properties and very slow permeability are limitations.

This soil is in capability subclass IVe and the Claypan Prairie range site.

26—Crockett fine sandy loam, 5 to 10 percent slopes, eroded. This deep, gently sloping to strongly sloping soil is on uplands. Individual areas are irregularly shaped and 20 to 40 acres. This soil has undergone gully and sheet erosion. The gullies are 3 to 10 feet deep. They are 10 to 75 feet wide, and they are 50 to 200 feet apart. In the areas between gullies most of the surface layer has been removed. Some areas have been damaged primarily by sheet erosion, so few or no gullies have formed. Most of the surface layer, however, has been removed by the sheet erosion.

Typically, the surface layer is brown, medium acid fine sandy loam about 8 inches thick. The subsoil from 8 to 30 inches is mottled light brownish gray, light yellowish brown, and strong brown clay that is medium acid. From 30 to 48 inches is mottled light brownish gray, light yellowish brown, and red clay that is slightly acid. From 48 to 60 inches is very pale brown, slightly acid clay that has red mottles.

This soil is moderately well drained. Runoff is medium. Permeability is very slow. Natural fertility and organic matter content are low. Available water capacity is high. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small amounts of noneroded Crockett soils and small amounts of Axtell and Mabank soils. Included soils make up as much as 15 percent of any mapped area.

This soil is used for pasture.

The soil has medium potential for forage production after land shaping, fertilization, establishment of improved grasses, and use of controlled grazing. Reclamation is possible in most areas. This soil is not suited to crops because of slope and erosion.

This soil has low potential for most urban and recreational development. Shrink-swell properties and the gullies are limitations that affect urban uses.

This soil is in capability subclass VIe and the Claypan Prairie range site.

27—Cuero sandy clay loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are small and somewhat elongated and are 15 to 60 acres.

The surface layer is very dark gray sandy clay loam about 5 inches thick. The subsoil from 5 to 14 inches is black clay loam. From 14 to 22 inches is very dark grayish brown sandy clay loam. From 22 to 35 inches is dark brown clay loam. The lower part of the subsoil from 35 to 47 inches is reddish brown sandy clay loam. The underlying layer from 47 to 58 inches is yellowish brown sandstone. The soil is typically moderately alkaline throughout, and it is calcareous in the lower part.

This soil is well drained. Runoff is medium. Permeability is moderate. Natural fertility, organic matter content, and available water capacity are high. The hazard of water erosion is moderate.

Included in some mapped areas of this soil are small amounts of Carbengle, Klump, and Knolle soils, a soil which is similar to the Cuero soil but which has a thinner, dark surface layer, and a soil that has a clayey subsoil. Included soils make up as much as 20 percent of some mapped areas.

This soil is used dominantly for pasture and rangeland.

This soil has high potential for forage production. Native and improved grasses, such as bermudagrass and kleingrass, are well suited to this soil. This soil has high potential for crops. The main crops are corn and cotton.

This soil has moderate potential for most urban and recreational development. It is limited by shrink-swell properties.

The soil is in capability subclass IIe and the Clay Loam range site.

28—Cuero sandy clay loam, 3 to 5 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are somewhat elongated and are 25 to 70 acres.

Typically, the surface layer is very dark gray, neutral sandy clay loam about 21 inches thick. The upper part of the subsoil from 21 to 33 inches is brown, neutral sandy clay loam. From 33 to 54 inches is brown, moderately alkaline sandy clay mottled with reddish yellow and dark reddish brown. From 54 to 66 inches is reddish brown sandy clay loam and large amounts of calcium carbonate. The lower part of the subsoil from 65 to 73 inches is reddish brown and yellowish red sandy clay

This soil is well drained. Runoff is medium. Permeability is moderate. Natural fertility, organic matter content, and available water capacity are high. The hazard of water erosion is slight.

Included in some mapped areas of this soil are small areas of Carbengle, Klump, and Knolle soils, and a soil which is similar to the Cuero soil but which is more clayey in the subsoil, and a soil that has a dark surface layer less than 20 inches thick. Included soils make up as much as 20 percent of a mapped area.

This soil is used dominantly for pasture and rangeland.

This soil has high potential for forage production, but it needs good management and additions of proper fertilizer. Improved bermudagrasses and kleingrass are well suited to this soil.

This soil has high potential for crops. The main crops are corn and cotton.

This soil has medium potential for most urban and recreational developments. The shrink-swell property is the main limitation.

This soil is in capability subclass IIIe and the Clay Loam range site.

29—Cuero sandy clay loam, 5 to 8 percent slopes. This deep, sloping soil is on uplands. Individual areas are small and somewhat elongated and are 20 to 60 acres.

Typically, the surface layer is very dark gray sandy clay loam about 18 inches thick. The subsoil from 18 to 60 inches is sandy clay loam. This horizon is dark grayish brown in the upper part, dark brown in the middle part, and reddish brown in the lower part. The underlying layer from 60 to 70 inches is yellowish brown sandstone. The soil is typically moderately alkaline throughout, and it is calcareous in the lower part.

This soil is well drained. Runoff is medium. Permeability is moderate. Natural fertility, organic matter content, and available water capacity are high. The hazard of water erosion is moderate.

Included in some mapped areas of this soil are small amounts of Carbengle, Klump, and Knolle soils. Also included are two soils that are similar to the Cuero soil, except one soil has a dark surface layer less than 20 inches thick and one has a clayey subsoil. Included soils make up less than 20 percent of any mapped area.

This soil is used dominantly for pasture and rangeland.

The soil has high potential for forage production. Native and improved grasses are well suited to this soil. This soil has medium potential for crops. The main crops are corn and cotton.

The soil has medium potential for most urban and recreational development. It is limited by shrink-swell properties.

This soil is in capability subclass IVe and the Clay Loam range site.

30—Falba fine sandy loam, 1 to 5 percent slopes. This moderately deep, gently sloping soil is on uplands. Individual areas are irregularly shaped and 50 to 130 acres.

Typically, the surface layer is light gray, medium acid fine sandy loam about 4 inches thick. The subsoil from 4 to 24 inches is gray, strongly acid clay. The underlying layer from 24 to 45 inches is light gray, strongly acid, weakly cemented clay.

This soil is somewhat poorly drained. A perched water table is above the subsoil during rainy periods. Runoff is slow to medium. Permeability is very slow. Natural fertility, organic matter content, and available water capacity are low. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small amounts of Shalba, Lufkin, Arol, and Burlewash soils and some Rock outcrop. Included soils make up as much as 15 percent of some mapped areas.

This soil is used dominantly for native or improved pasture. Yields for improved bermudagrass are medium if the soil is well managed, including additions of fertilizer and lime. Native vegetation is post oak, elm, briars, uniola, yaupon, and cedar. This soil has low potential for crops.

The soil has low potential for most urban and recreational development. Shrink-swell properties, moderate depth of soil, and very slow permeability are limitations.

This soil is in capability subclass IVe and the Claypan Savannah range site.

31—Frelsburg clay, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are irregularly shaped and are 20 to 200 acres.

Typically, the soil is dark gray clay to about 55 inches. From 55 to 75 inches is light gray clay. The soil is moderately alkaline and calcareous throughout.

This soil is well drained. Runoff is medium. Permeability is very slow. Natural fertility and organic matter content are medium. Available water capacity is high. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small areas of Bleiblerville and Wilson soils. Included soils make up less than 15 percent of each mapped area.

This soil is used dominantly for pasture or rangeland. Some areas are in corn and grain sorghum. A large part of this soil was cultivated in the past.

This soil has high potential for crops and pasture. It is well suited to improved bermudagrass and kleingrass.

This soil has low potential for urban and recreational development. Shrink-swell properties; low strength, which affects roads and streets; and very slow permeability are limitations.

This soil is in capability subclass IIe and the Blackland range site.

32—Frelsburg clay, 3 to 5 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are irregularly shaped and are 20 to 150 acres.

Typically, the surface layer is very dark gray clay to about 11 inches. From 11 to 34 inches is dark gray clay. The lower part from 34 to 57 inches is light brownish gray clay. The soil is moderately alkaline and calcareous throughout.

This soil is well drained. Runoff is medium. Permeability is very slow. Natural fertility and organic matter content are medium. Available water capacity is high. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small areas of Bleiblerville and Latium soils. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly for pasture and rangeland. A few areas are cultivated to corn and grain sorghum. A large part of this soil was cultivated in the past.

This soil has medium potential for corn and grain sorghum. It has high potential for pasture. It is well suited to improved bermudagrass and kleingrass.

This soil has low potential for urban and recreational development. Shrink-swell properties; low strength, which affects roads and streets; and very slow permeability are limitations.

This soil is in capability subclass IIIe and the Blackland range site.

33—Frelsburg clay, 5 to 8 percent slopes. This deep, sloping soil is on uplands. Individual areas are irregularly shaped and are 20 to 200 acres in size.

Typically, this soil is clay to a depth of 65 inches or more. It is very dark gray in the upper few inches, dark gray to a depth of about 46 inches, and mottled with gray, olive, and yellow in the lower part.

This soil is well drained. Runoff is medium. Permeability is very slow. Natural fertility and organic matter content are medium. Available water capacity is high. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small amounts of Latium soils and Frelsburg clay, 3 to 5 percent slopes. Some small areas of eroded washes and rills are included. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly for pasture or rangeland. Most of this soil was cultivated in the past.

This soil has high potential for pasture. It is well suited to improved bermudagrass and kleingrass. This soil has medium potential for crops. The main crops are corn, cotton, and grain sorghum.

This soil has low potential for urban and recreational development. Shrink-swell properties; low strength, which affects roads and streets; and very slow permeability are limitations.

This soil is in capability subclass IVe and the Blackland range site.

34—Gowen clay loam, frequently flooded. This deep, nearly level soil is on flood plains. Flooding occurs briefly 3 times or more a year. Individual areas are elongated and 50 to 300 acres.

Typically, the surface layer is very dark grayish brown, neutral clay loam about 24 inches thick. The subsoil from 24 to 44 inches is grayish brown, moderately alkaline clay loam. The underlying layer from 44 to 60 inches is grayish brown, moderately alkaline clay loam.

This soil is well drained. Runoff is slow to medium. Permeability is moderate. Natural fertility, organic matter content, and available water capacity is high.

Included in some mapped areas of this soil are small amounts of Bosque and Kaufman soils and a soil which

is like the Gowen soil but which has a dark surface layer less than 20 inches thick. Included soils make up less than 15 percent of each mapped area.

This soil is used dominantly for improved pasture.

This soil has high potential for pasture forage, but it needs good management and additions of proper fertilizers. Improved bermudagrass, kleingrass, bahiagrass, and johnsongrass are well suited to this soil. This soil has low potential for crops because of flooding.

Flooding is the limitation for both urban and recreational development.

This soil is in capability subclass Vw and the Loamy Bottomland range site.

35—Greenvine clay, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on uplands. Individual areas are irregularly shaped and 15 to 45 acres.

Typically, the surface layer is very dark gray, neutral clay about 18 inches thick. From 18 to 31 inches is gray, moderately alkaline clay. The underlying layer from 31 to 50 inches is grayish brown, strongly acid tuffaceous clay interbedded with sandstone.

This soil is moderately well drained. Runoff is slow to medium. Permeability is very slow. Natural fertility, organic matter content, and available water capacity are low. The hazard of water erosion is severe. The underlying layer of clay and sandstone is impervious to roots, except in the cracks and fractures.

Included in some mapped areas of this soil are small amounts of Falba, Arol, Burlewash, and Mabank soils. A soil which is similar to the Greenvine soil but which is more than 40 inches deep to tuffaceous clay and sandstone is on less sloping parts of the landscape. Included soils make up less than 15 percent of any mapped area.

This soil is used dominantly as native or improved pasture.

This soil has high potential for pasture forage, but it needs good management and additions of proper fertilizer. Improved bermudagrasses, bahiagrass, and kleingrass are well suited to this soil. This soil has medium potential for crops. The main crops are corn, cotton, and grain sorghum.

This soil has low potential for most urban and recreational development. Shrink-swell properties, moderate depth, and very slow permeability are limitations.

This soil is in capability subclass IIe and the Blackland range site.

36—Greenvine clay, 3 to 5 percent slopes. This moderately deep, gently sloping soil is on uplands. Individual areas are irregularly shaped and 15 to 40 acres.

Typically, the surface layer is very dark gray, neutral clay about 24 inches thick. From 24 to 29 inches is dark gray, moderately alkaline clay. The underlying layer from 29 to 35 inches is light brownish gray, strongly acid, tuffaceous clay.

This soil is moderately well drained. Runoff is slow to medium. Permeability is very slow. Natural fertility and organic matter content are medium. Available water capacity is high. The hazard of water erosion is severe. The tuffaceous clays are largely impervious to roots.

Included in some mapped areas of this soil are small amounts of Arol, Falba, and Mabank soils. Also included are a soil that is less than 20 inches to tuffaceous clays and one that is more than 40 inches to tuffaceous clays. Included soils make up less than 15 percent of each mapped area.

This soil is used dominantly for native or improved pasture.

This soil has high potential for forage production, but it needs good management and additions of proper fertilizer. Improved bermudagrasses, bahiagrass, and kleingrass are well suited to this soil. This soil has low potential for crops.

The soil has low potential for most urban and recreational development. Shrink-swell properties, moderate depth, and very slow permeability are limitations.

This soil is in capability subclass IIIe and the Blackland range site.

37—Kaufman clay, frequently flooded. This deep, nearly level soil is on bottom lands. It is flooded from 1 to 2 times each year for brief to long periods. Individual areas are mainly elongated and are 50 to 1,000 acres.

Typically, the surface layer is very dark gray, mildly alkaline clay about 8 inches thick. From 8 to 60 inches is dark gray, mildly alkaline clay.

This soil is somewhat poorly drained. Runoff is slow. Natural fertility, organic matter content, and available water capacity are high. Permeability is very slow. The hazard of water erosion is slight.

Included in some mapped areas of this soil are small amounts of a soil which is similar to the Kaufman soil but which is calcareous throughout. Also included are some areas of a soil that has lighter colors below about 12 inches. Included soils make up as much as 10 percent of a mapped area.

This soil is used dominantly as pasture.

This soil has high potential for forage production. Improved bermudagrass, bahiagrass, kleingrass, and dallisgrass are well suited to this soil. This soil has low potential for crops because of the hazard of flooding.

Flooding, shrink-swell properties, and very slow permeability are limitations for both urban and recreational development.

This soil is in capability subclass Vw and the Clayey Bottomland range site.

38—Klomatia and Norwood soils, frequently flooded. This map unit consists of deep soils on bottom lands. These soils are nearly level to gently undulating.

Slopes are 0 to 3 percent. Most areas are on the insides of bends in the river. Individual areas are elongated to round and 20 to 80 acres. These areas are flooded for brief periods two or three times each year.

Kiomatia soils make up about 36 percent of the map unit; Norwood soils make up 29 percent, and other soils make up about 35 percent. The Norwood soil is near the stream channel. The Kiomatia soil is adjacent to the stream channel on slightly higher positions of the landscape. These soils are not uniform and are not in a regular pattern.

Typically, the Kiomatia surface layer is light brown loamy fine sand about 4 inches thick. From 4 to 60 inches is light brown loamy fine sand and thin strata of darker material. The soil is typically moderately alkaline and calcareous throughout.

Kiomatia soil is well drained. Runoff is slow. Permeability is rapid.

Typically, the surface layer of the Norwood soil is reddish brown silt loam about 13 inches thick. The underlying layer from 13 to 80 inches is stratifications of silt loam, very fine sandy loam, and silty clay loam that are reddish brown, light reddish brown, and yellowish red. This soil is typically calcareous and moderately alkaline throughout.

The Norwood soil is well drained. Runoff is slow. Permeability is moderate. Available water capacity is high.

The other soils in the map unit are primarily of the Belk and Clemville series. They are in backwater areas and sloughs. Some areas of a soil that is sandy throughout are near the stream channels.

The areas of this map unit are somewhat unstable. Those that are near the river can change drastically when heavy overflows deposit new materials and channels shift across the bottom land.

These soils are dominantly used for pasture. They are well suited to improved bermudagrass.

Many areas are in native willow, cottonwood, ash, sycamore, vines, and weeds and some grasses. Some low areas are barren of vegetation because of the frequency of flooding.

These soils have low potential for cultivation because of the flooding frequency.

Flooding is the limitation for both urban and recreational development.

These soils are in capability subclass Vw; the Kiomatia part is in Sandy Bottomland range site, and the Norwood part is in Loamy Bottomland range site.

39—Klump loamy sand, 1 to 3 percent. This deep, gently sloping soil is on uplands. Individual areas are somewhat elongated and 15 to 50 acres.

Typically, the surface layer is dark brown, slightly acid loamy sand about 15 inches thick. The subsoil from 15 to 62 inches is neutral, mottled red and strong brown clay loam.

This soil is well drained. Runoff is medium and permeability is moderate. Natural fertility, organic matter content, and available water capacity are high.

Included in some mapped areas of this soil are small amounts of Cuero, Carbengle, and Knolle soils and a soil which is similar to the Klump soil but which has a more clayey subsoil. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly for pastures of improved bermudagrass, but most of it has been cultivated in the past. A few areas are presently being used for corn and grain sorghum.

This soil has medium potential for crops. It has high potential for pasture. Improved bermudagrass, bahiagrass, and kleingrass do well on this soil.

The soil has high potential for urban and recreational development.

This soil is in capability subclass IIe and the Sandy Loam range site.

40—Klump loamy sand, 3 to 5 precent slopes. This deep, gently sloping soil is on uplands. Individual areas are irregularly shaped to elongated and 20 to 80 acres.

Typically, the surface layer is loamy sand about 11 inches thick. It is very dark brown in the upper part and dark brown in the lower part. The upper part of the subsoil from 11 to 30 inches is dark reddish brown sandy clay loam that grades to red in the lower part. The lower part of the subsoil from 30 to 45 inches is yellowish red sandy loam. The underlying layer from 45 to 60 inches is strong brown loamy sand. The soil is typically slightly acid in the upper part and medium acid to strongly acid in the lower part.

This soil is well drained. Runoff is medium, and permeability is moderate. Natural fertility, organic matter content, and available water capacity are high.

Included in some mapped areas of this soil are small amounts of Cuero, Carbengle, Knolle soils and a soil which is similar to the Klump soil but which has a clayey subsoil. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly for pasture. Most of these areas have been cultivated in the past.

This soil has high potential for pasture. Improved bermudagrass, kleingrass, and bahiagrass do well on this soil. This soil has medium potential for crops. The main crop is sorghum.

This soil has high potential for urban and recreational development.

The soil is in capability subclass IIIe and the Sandy Loam range site.

41—Klump loamy sand, 5 to 8 percent slopes. This deep, sloping soil is on uplands. Individual areas are irregularly shaped to elongated and 15 to 100 acres.

Typically, the surface layer is loamy sand about 13 inches thick. It is dark grayish brown in the upper part and grades to brown in the lower part. The subsoil from

13 to 56 inches is sandy clay loam that is brown in the upper part, dark red in the middle part, and yellowish red in the lower part. From 56 to 64 inches is yellowish sandy loam. This soil is typically slightly acid in the surface layer and slightly to strongly acid below.

This soil is well drained. Runoff is medium, and permeability is moderate. Natural fertility, organic matter content, and available water capacity are high.

Included in some areas of this soil are small amounts of Cuero, Carbengle, and Knolle soils. Also included are small amounts of a soil which is similar to the Klump soil but which has a clayey subsoil; a few areas of Klump loamy sand, 3 to 5 percent slopes; and some small spots of eroded rills and washes. Included soils make up as much as 15 percent of a mapped area.

This soil is used dominantly for pastures of improved bermudagrass. Kleingrass and bahiagrass are also adapted to the soil. Most of these areas have been cultivated in the past. This soil has medium potential for crops. The main crops are corn and grain sorghum.

This soil has high potential for urban and recreational development, but slope is the limiting factor.

This soil is in capability subclass IVe and the Sandy Loam range site.

42—Knolle coarse sand, 2 to 8 percent slopes. This deep, gently sloping and sloping soil is on uplands. Individual areas are irregularly shaped to rounded and are 10 to 80 acres.

Typically, the surface layer is grayish brown coarse sand about 8 inches thick. From 8 to 12 inches is grayish brown loamy coarse sand. The subsoil from 12 to 46 inches is yellowish red sandy clay loam. The underlying layer from 46 to 62 inches is strong brown loamy coarse sand. This soil is typically slightly acid in the upper part and medium acid to strongly acid in the lower layers.

This soil is well drained. Runoff is slow. Permeability is moderate. Natural fertility and organic matter content are moderate. Available water capacity is low. The hazard of erosion is moderate.

Included in some mapped areas of this soil are small amounts of Klump and Carbengle soils. On crests of hills are small areas of calcareous, sandstone outcrops and a soil that is dark, calcareous loamy fine sand to a depth of more than 60 inches. Included soils make up less than 15 percent of any mapped area.

This soil is used for improved or native pasture. Most areas have been in crops at one time.

The potential for forage production is medium. Improved bermudagrasses and kleingrass are well suited. This soil has low potential for crops.

This soil has high potential for most urban and recreational development. A sandy surface layer and slope are limitations to these uses.

This soil is in capability subclass IIIs and the Sandy Loam range site.

43—Latium clay, 3 to 5 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are irregularly shaped and are 20 to 100 acres.

Typically, the surface layer is very dark gray clay about 6 inches thick. From 6 to 72 inches is mottled grayish brown and brownish yellow clay. From 72 to 80 inches is mottled brownish yellow and light gray clay. The soil is moderately alkaline and calcareous throughout.

This soil is well drained. Runoff is medium. Permeability is very slow. Natural fertility and organic matter content are low. Available water capacity is high. The hazard of erosion is severe.

Included in some mapped areas of this soil are small amounts of Frelsburg and Brenham soils. Included soils make up less than 15 percent of any mapped area.

This soil is used dominantly for pasture and the production of hay.

This soil has high potential for forage production, but it needs good management and additions of the proper fertilizer. Improved bermudagrass and kleingrass are adapted to this soil. This soil has medium potential for crops. The main crops are corn, cotton, and grain sorghum. Native vegetation is mainly bluestem, threeawn grasses, and scattered trees.

This soil has low potential for most urban and recreational development. Shrink-swell properties; low strength, which affects roads and streets; and very slow permeability are limitations.

This soil is in capability subclass IIIe and the Eroded Blackland range site.

44—Latium clay, 5 to 8 percent slopes. This deep, sloping soil is on uplands. Individual areas are irregularly shaped and are 20 to 200 acres.

Typically, the surface layer is dark grayish brown clay about 4 inches thick. From 4 to 33 inches is light olive brown clay. From 33 to 70 inches is light gray clay. The soil is moderately alkaline and calcareous throughout.

This soil is well drained. Runoff is medium. Permeability is very slow. Natural fertility and organic matter content are low. Available water capacity is high. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small amounts of Frelsburg and Brenham soils. These included soils make up less than 15 percent of a mapped area.

This soil is used dominantly for pasture and the production of hay.

This soil has high potential for forage production, but it needs proper management and additions of fertilizer. Native vegetation is mainly bluestems, threeawn grasses, and scattered trees. This soil has low potential for crops.

This soil has low potential for most urban and recreational development. Shrink-swell; low strength, which affects roads and streets; and very slow permeability are limitations.

This soil is in capability subclass IVe and the Eroded Blackland range site.

45—Latium clay, 4 to 12 percent slopes, eroded. This deep, sloping and strongly sloping soil is on uplands. Individual areas are irregularly shaped and are 20 to 100 acres. This soil has undergone gully and sheet erosion. The gullies are 3 to 20 feet deep. They are 10 to 50 feet wide, and 100 to 500 feet apart. Some areas have been damaged primarily by sheet erosion and have few or no gullies; however, most of the surface layer has been removed in these areas.

Typically, the surface layer is dark grayish brown clay about 3 inches thick. From 3 to 25 inches is brownish yellow clay. From 25 to 65 inches is mottled brownish yellow and light gray clay. This soil is moderately alkaline and calcareous throughout.

This soil is well drained. Runoff is rapid. Permeability is very slow. Natural fertility is medium, and organic matter content is medium to low. Available water capacity is medium. The hazard of water erosion is severe. Gullies are readily apparent, and they cannot be crossed by agricultural equipment.

Included in some mapped areas of this soil are small amounts of Frelsburg and Brenham soils and Latium clay, 5 to 8 percent slopes. Included soils make up as much as 15 percent of a mapped area.

Native vegetation is mainly bluestem, threeawn grasses, and scattered trees. This soil has medium potential for forage production after reclamation, but it needs shaping by mechanical means, fertilization, establishment of proper grasses, and controlled grazing. It is not suited to crops because of slope and erosion.

This soil has low potential for most urban and recreational development. Shrink-swell properties; low strength, which affects roads and streets; very slow permeability; and slope are limitations.

This soil is in capability subclass VIe and the Eroded Blackland range site.

46—Lufkin fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on uplands and terraces. Individual areas vary widely in shape and are 15 to 100 acres in size.

Typically, the surface layer is grayish brown, strongly acid fine sandy loam about 8 inches thick. The subsoil from 8 to 15 inches is slightly acid clay that is gray in the upper part and grayish brown in the lower part. From 15 to 35 inches the subsoil is gray, moderately alkaline clay. From 35 to 48 inches is light gray moderately alkaline, sandy clay. From 48 to 80 inches is light gray, moderately alkaline sandy clay loam.

This soil is somewhat poorly drained to poorly drained. A perched water table is above the subsoil during rainy periods. Runoff is slow. Permeability is very slow. Natural fertility and organic matter content are low. Available water capacity is medum. Water erosion is slight.

Included in some mapped areas are small amounts of a soil which is similar to this Lufkin soil but which has a thicker surface layer. Also included are Crockett, Falba, Mabank, Tabor, and Wilson soils, and Lufkin fine sandy loam that has 1 to 5 percent slopes. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly as pasture and rangeland.

This soil has medium potential for forage production, but it needs good management, which includes fertilization. Improved bermudagrass and bahiagrass are well suited to this soil.

This soil has low potential for most urban and recreational development. Shrink-swell properties and wetness are limitations.

This soil is in capability subclass IIIw and the Claypan Savannah range site.

47—Mabank fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on terraces and uplands. Individual areas are somewhat oval to elongated and are 15 to 80 acres.

Typically, the surface layer is gray, medium acid fine sandy loam about 8 inches thick. The subsoil from 8 to 36 inches is dark gray, medium acid clay. From 36 to 62 inches is gray, neutral clay.

This soil is somewhat poorly drained. A perched water table on the subsoil saturates the surface layer during rainy periods. Runoff and permeability are very slow. Natural fertility and organic matter content are low. Available water capacity is medium. The hazard of water erosion is slight.

Included in some mapped areas of this soil are small amounts of Crockett, Lufkin, and Wilson soils. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly as pasture and rangeland.

This soil has medium potential for forage production, but it needs good management and additions of proper fertilizer. Improved bermudagrasses, kleingrass, and bahiagrass are well suited to the soil. This soil has low potential for crops.

This soil has low potential for most urban and recreational development. Shrink-swell properties, wetness, very slow permeability, and low strength for roads and streets are limitations.

This soil is in capability subclass IIIw and the Claypan Prairie range site.

48—Mabank fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on terraces and uplands. Individual areas are oval to elongated and are 20 to 60 acres.

Typically, the surface layer is light brownish gray, medium acid fine sandy loam about 5 inches thick. The upper part of the subsoil from 5 to 18 inches is dark gray, neutral clay. From 18 to 35 inches is gray, moderately alkaline clay. The lower part of the subsoil from 35 to 60 inches is light gray, calcareous, moderately alkaline sandy clay.

This soil is somewhat poorly drained. A perched water table on the subsoil saturates the surface layer during rainy periods. Runoff is medium. Permeability is very slow. Natural fertility and organic matter content are low.

Available water capacity is medium. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small amounts of Arol, Crockett, Falba, Lufkin, Shalba, and Wilson soils. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly as pasture and rangeland.

The soil has medium potential for forage production but it needs good management, which includes additions of fertilizer. Improved bermudagrass, kleingrass, and bahiagrass are well suited to the soil. This soil has low potential for crops.

This soil has low potential for most urban and recreational development. Shrink-swell properties and low strength, which affects roads and streets, are limitations.

This soil is in capability subclass IIIe and the Claypan Prairie range site.

49—Nahatche clay loam, frequently flooded. This deep, nearly level soil is on bottom lands. Individual areas are long and narrow and are 50 to 300 acres. This soil is flooded several times each year for brief periods.

Typically, the surface layer is grayish brown, mildly alkaline clay loam about 8 inches thick. From 8 to 21 inches is grayish brown, neutral clay loam. From 21 to 24 inches is dark grayish brown, neutral clay loam. The underlying layer from 24 to 60 inches is gray, neutral sandy clay loam.

This soil is somewhat poorly drained. Runoff is slow. Permeability is moderate. Natural fertility and organic matter content are moderate. Available water capacity is medium.

Included in some mapped areas of this soil are small amounts of Gowen and Bosque soils and a soil which is similar to the Nahatche soil but which is sandier throughout. The Gowen and Bosque soils occur where the drainageways merge. The sandier soil is generally near the creek channel. Included soils make up less than 15 percent of a mapped area.

This soil is used for pasture.

Improved grasses for forage, such as improved bermudagrass, and bahiagrass are well suited to this soil. Native vegetation includes pecan, ash, hackberry, grape, broomsedge, briars, and berry vines. This soil is flooded too frequently to be used for crops.

Flooding is the limitation for urban development.

This soil is in capability subclass Vw and the Loamy Bottomland range site.

50—Norwood silt loam, 0 to 1 percent slopes. This deep, nearly level soil is on bottom lands. Individual areas are elongated and are 30 to 150 acres. This soil is rarely flooded.

Typically, the surface layer is reddish brown silt loam about 8 inches thick. The underlying layer from 8 to 60 inches is stratified, light reddish brown silt loam and thin strata of darker clay loam, silty clay loam, and clay. The soil is moderately alkaline and calcareous throughout.

This soil is well drained. Runoff is slow, and permeability is moderate. Natural fertility and organic matter content are moderate. Available water capacity is high.

Included in some mapped areas of this soil are small amounts of three soils that are similar to the Norwood soil except one has a surface layer of silty clay loam, another is very fine sandy loam throughout, and another is underlain with clay at a depth of about 30 inches. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly for improved or native pasture. Improved bermudagrass and kleingrass are adapted to this soil. Some areas are cultivated to cotton and grain sorghum. All yields are high.

This soil has high potential for crops. The main crops are cotton and grain sorghum.

Flooding is the limitation for both urban and recreational development.

This soil is in capability class I and the Loamy Bottomland range site.

51—Oklared very fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on bottom lands. Individual areas are elongated and are 20 to 100 acres. This soil is rarely flooded.

Typically, the surface layer is reddish brown very fine sandy loam about 8 inches thick. From 8 to 60 inches is reddish brown fine sandy loam, which contains strata of finer materials. The soil is typically moderately alkaline and calcareous throughout.

This soil is well drained. Runoff is slow. Permeability is moderately rapid. Natural fertility is high, and organic matter content is moderate. Available water capacity is medium.

Included in some mapped areas of this soil are small amounts of Norwood soils and a soil which is similar to the Oklared soil but which has a darker surface layer. Some areas have a more clayey layer in the lower part of the profile. Included soils make up as much as 15 percent of a mapped area.

This soil is used for crops and improved pasture.

The soil has high potential for crops and forage production. The main crops grown are cotton and grain sorghum. Improved bermudagrasses and kleingrass are well suited to this soil.

This soil has high potential for recreational use; however, it is on a flood plain that is subject to rare flooding. Flooding is a limitation for urban development.

This soil is in capability class I and the Loamy Bottomland range site.

52—Oklared-Norwood complex, occasionally flooded. This complex consists of deep, alluvial soils. These soils are nearly level but the surface has low undulations. Slopes are 0 to 1 percent. The individual areas are enlongated and 20 to 150 acres. The soils are flooded about 1 year out of every 3 years for very brief periods.

Oklared soils make up about 58 percent of the complex, Norwood soils make up 26 percent, and other soils make up about 16 percent. The Oklared soils are generally on the higher parts of the undulations, and Norwood soils are in the lower parts. These soils are so intricately mixed that separation is not practical at the scale mapped.

Typically, the Oklared soil has a surface layer of brown very fine sandy loam about 6 inches thick. From 6 to 16 inches is brown, stratified very fine sandy loam that contains strata of silt loam and very fine sandy loam. This soil is moderately alkaline and calcareous throughout.

Typically, the Norwood soil is brown silty clay loam that has strata of silt loam and fine sandy loam to a depth of 60 inches. This soil is moderately alkaline and calcareous throughout.

These soils are well drained. A high water table is at a depth of 3.0 to 4.0 feet during rainy seasons in some areas. The Oklared soil is moderately rapidly permeable, and the Norwood soil is moderately permeable. Surface runoff is slow.

Other soils in this soil complex are small amounts of Kiomatia soils adjacent to stream and river channels and a deep, clayey soil in depressions. These soils make up about 4 percent of the mapped areas.

These soils are used mainly for pasture.

The soils of this complex have low potential for crops because of the flood hazard. These soils have high potential for improved pasture grasses. The principal grasses grown are improved bermudagrass and kleingrass. These soils have medium potential for range. Many areas are overgrown with cottonwood, willow, briars, berry vines, and ash. Management needed is primarily the control of woody vegetation and controlled grazing.

Flooding is the limitation for both urban and recreational development.

These soils are in capability subclass IIw and the Loamy Bottomland range site.

53—Padina loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are oval to somewhat elongated and are 20 to 80 acres.

Typically, the surface layer is yellowish brown, neutral loamy fine sand about 25 inches thick. From 25 to 60 inches is light yellowish brown, slightly acid loamy fine sand. The subsoil from 60 to 80 inches is mottled reddish yellow and white, medium acid sandy clay loam.

This soil is moderately well drained. Runoff is slow. Permeability is moderately slow. Natural fertility and organic matter content are very low. Available water capacity is low. The hazard of water erosion is moderate.

Included in some mapped areas of this soil are small amounts of Chazos, Silawa, and Tremona soils and a soil which is like the Padina soil but which has a thicker, sandy upper layer. Included soils make up as much as 15 percent of a mapped area.

This soil is used dominantly as pasture and rangeland.

This soil has high potential for forage production, but it needs good management and additions of lime and the proper fertilizer. Improved bermudagrasses and bahiagrass are well suited to this soil. In most areas native vegetation is a dense stand of post and blackjack oak and an understory of yaupon. This soil has low potential for crops. The main crops are watermelon and peanuts.

This soil has medium potential for most urban and recreational development. Slope and wetness are limitations.

This soil is in capability subclass IIIe and the Deep Sand range site.

54—Pits. Pits are areas where the soils and the underlying strata have been removed to be used as sources of gravel and sand for road bases or embankments. The pits in this area are of two major types. The first consists of shallow pits from which the upper layers of the soil have been removed for the gravel. This material is removed without much disturbance to the subsoil. In most places the subsoil is left without any signs of disturbance except for slight changes in elevation. The second consists of pits which have vertical walls and which range in depth from a few feet to as much as 30 feet. Sandstone is taken from these pits primarily for road construction. Some of the harder sandstone has been used as riprap along water impoundments. Other types of pits have resulted from the removal of clayey material for road construction. All the pits, except the gravel pits, hold water throughout the year. Some of the large pits holding water are shown on the soil maps as water bodies.

Reclamation of the gravel pits is somewhat easier than the other pits because the topography has been left much smoother. The sandstone rock and clay pits are difficult to reclaim because of depth and the lack of soil material in the surrounding area to use as backfill.

55—Rehburg loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are irregularly shaped and are 20 to 80 acres.

Typically, the surface layer is very pale brown, medium acid loamy fine sand about 12 inches thick. From 12 to 23 inches is white, medium acid loamy fine sand. The upper part of the subsoil from 23 to 36 inches is light brownish gray, strongly acid clay. The lower part of the subsoil from 36 to 44 inches is light brownish gray, strongly acid clay loam. The underlying layer from 44 to 60 inches is mottled gray, pale olive, and yellowish brown, strongly acid, weakly cemented sandstone and clay.

This soil is somewhat poorly drained. A perched water table is on the subsoil during rainy periods. Runoff is slow. Permeability is very slow. Natural fertility, organic matter content, and available water capacity are low. The hazard of water erosion is moderate.

Included in some mapped areas of this soil are small amounts of two soils that are similar to the Rehburg soil except one has a sandy surface layer more than 40 inches deep and another has less than 20 inches of sandy surface soil. Small areas of Rehburg loamy fine sand that has 5 to 8 percent slopes are included. Included soils make up as much as 15 percent of a mapped area.

This soil is used dominantly for pasture or native range.

This soil has high potential for forage production, but it needs good management and additions of proper fertilizer and lime. Improved bermudagrass and bahiagrass are well suited. This soil has low potential for crops.

This soil has a low potential for urban and recreational development. Depth to rock is the main limitation.

This soil is in capability subclass IIIe and the Sandy range site.

56—Renish clay loam, 1 to 5 percent slopes. This shallow and very shallow, gently sloping soil is on uplands. Individual areas are irregularly shaped to somewhat elongated and 20 to 100 acres.

Typically, the surface layer is dark grayish brown, calcareous clay loam about 12 inches thick and is over calcareous indurated sandstone.

This soil is well drained. Runoff is rapid. Permeability is moderate. Natural fertility is low because of the depth to rock. Available water capacity is very low, and the soil is droughty during the drier summer months.

Included in some mapped areas of this soil are two soils that are similar to the Renish soil except that one is less than 7 inches deep over sandstone and another is more than 20 inches deep over sandstone. Also included is some sandstone rock outcrop. Included soils and Rock outcrop make up as much as 15 percent of a mapped area. This soil is used mainly for pasture. Many areas are used for temporary winter pasture. Some areas have been planted to improved bermudagrass. This grass does well during most of the year except during the drier summer months.

The soil has medium potential for pasture. It has low potential for crops because of depth to bedrock.

This soil is in capability subclass IVs and the Chalky Ridge range site.

57—Renish clay loam, 5 to 12 percent slopes. This shallow and very shallow, gently to strongly sloping soil is on uplands. Individual areas are elongated and sloping and are 20 to 40 acres.

Typically, the surface layer is dark brown, calcareous clay loam about 4 inches thick. From 4 to 16 inches is very dark grayish brown, calcareous clay loam. Indurated, calcareous sandstone is at a depth of 16 inches.

This soil is well drained. Runoff is rapid. Permeability is moderate. Natural fertility is low because of the depth to rock. Available water capacity is very low. This soil is droughty.

Included in some mapped areas of this soil are small amounts of Carbengle soils and some rock outcrop. Included soils and Rock outcrop make up less than 15 percent of a mapped area.

This soil is used for pasture. Many areas are used for temporary pasture. Some areas have been planted to improved bermudagrass, which does well except during the dry season.

This soil has medium potential for pasture. It has low potential for crops because of depth to rock and slope.

This soil has low potential for urban and recreational development. Depth to rock and slope are the limiting factors.

This soil is in capability subclass VIe and the Chalky Ridge range site.

58—Renish-Rock outcrop complex, 1 to 12 percent slopes. This complex consists of shallow and very shallow soils and Rock outcrop. Individual areas are elongated and 40 to 120 acres.

The Renish soil makes up about 60 percent of the areas, Rock outcrop makes up 30 percent, and other soils make up 10 percent. The Rock outcrop is on slightly higher positions in the landscape. This soil and Rock outcrop are so intricately mixed that separation is not practical at the scale mapped.

Typically, the Renish soil has a surface layer of very dark grayish brown clay loam about 11 inches thick. From 11 to 15 inches is very dark grayish brown gravelly clay loam. Below 15 inches is indurated sandstone. The soil is calcareous and moderately alkaline throughout.

The Renish soil is well drained. Runoff is rapid. Permeability is moderate. Natural fertility and organic matter content are low because of the very shallow and shallow depth to rock. Available water capacity is very low.

Typically, the Rock outcrop is white, strongly cemented, calcareous sandstone that is coarsely fractured (fig. 9).

The other soil in this complex is the Carbengle soil, which makes up as much as 15 percent of a mapped area.

This complex is not suited to cultivation because of the shallow and very shallow depth of the soil to rock and Rock outcrop. This soil has high potential for rangeland (fig. 10). It is not suited to crops.

This complex has low potential for urban and recreational development because of the depth of the soil to rock and the Rock outcrop. The asthetic value of these areas is high because of the scenic views and the large live oak, which are present in most places. Some areas make good residental sites if the limitations are overcome.

This soil is in capability subclass VIe and the Chalky Ridge range site.

Figure 9.—Rock pit showing sandstone beneath Renish-Rock outcrop complex, 1 to 12 percent slopes. The sandstone is used as road base.

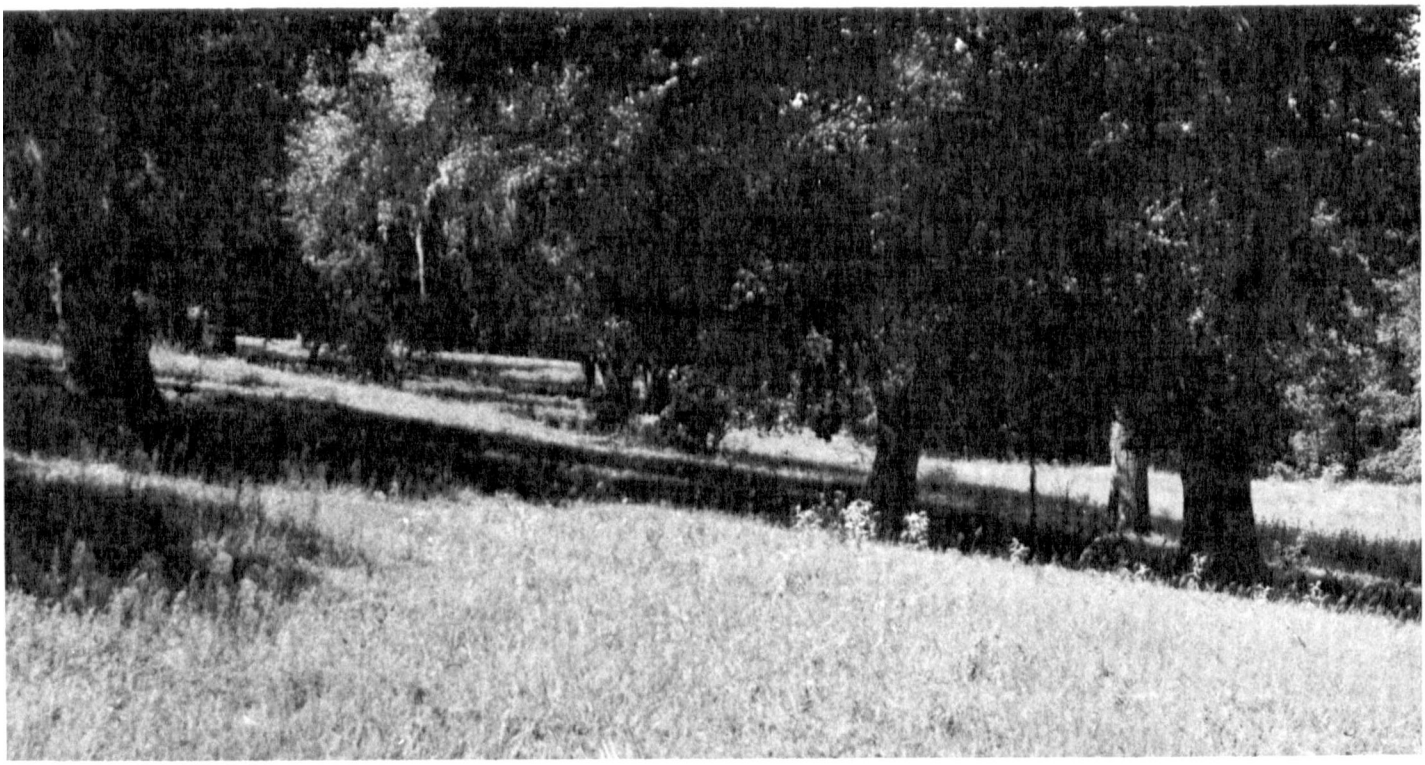


Figure 10.—Renish-Rock outcrop complex, 1 to 12 percent slopes, in native vegetation. It is in the Chalky Ridge range site.

59—Shalba fine sandy loam, 1 to 5 percent slopes. This shallow and very shallow, gently sloping soil is on uplands. Individual areas are irregularly shaped and 15 to 40 acres.

Typically, the surface layer is light gray, very strongly acid fine sandy loam about 4 inches thick. The subsoil from 4 to 18 inches is grayish brown, very strongly acid clay. The underlying layer at 18 inches is light gray, weakly cemented, tuffaceous sandstone.

This soil is somewhat poorly drained. A perched water table on the subsoil saturates the surface layer during rainy periods. Runoff is medium. Permeability is very slow. Natural fertility and organic matter content are low. Available water capacity is very low. The hazard of water erosion is severe.

Included in mapped areas of this soil are areas of Falba, Burlewash, Arol, and Greenvine soils. Some small rock outcrops are near streams. The included soils and rock outcrops make up as much as 15 percent of a mapped area.

This soil is used for pasture or rangeland. Native vegetation is post oak, cedar, yaupon, and live oak and grasses, primarily of little bluestem, purpletop, and needlegrass.

The soil has low potential for forage production. It is not suited to crops because of rooting depth.

This soil has low potential for most urban and recreational development because of its depth to rock, very slow permeability, and wetness.

This soil is in capability subclass VIe and the Claypan Savannah range site.

60—Shalba-Rock outcrop complex, 1 to 8 percent slopes. This complex consists of shallow and very shallow soils and Rock outcrop on uplands. Individual areas are elongated and 15 to 40 acres.

The Shalba soil makes up about 33 percent of the complex, Rock outcrop and rock that has a thin layer of fine sandy loam on the surface make up about 50 percent, and other soils make up about 17 percent. Rock outcrop is on slightly higher positions in the landscape. These soils and Rock outcrop are so intricately mixed that separation is not practical at the scale mapped.

Typically, the Shalba soil has a surface layer of gray fine sandy loam about 2 inches thick. The subsoil from 2 to 18 inches is very dark grayish brown clay. The underlying layer is cemented, tuffaceous sandstone. The soil is typically very strongly acid throughout.

The Shalba soil is somewhat poorly drained. A perched water table on the clayey subsoil saturates the surface layer during rainy periods. Runoff is medium. Permeability is very slow.

Typically, Rock outcrop is white, slightly to strongly cemented, tuffaceous sandstone. In places 3 inches or more of fine sandy loam is on the surface.

Other soils in mapped areas are small amounts of Arol, Falba, Burlewash, and Greenvine soils. These soils make up as much as 17 percent of a mapped area.

This complex is not suited to cultivation because of the Rock outcrop and depth of the soil to sandstone. Most areas have scattered live oak and some cedar trees. The main grasses are threeawn and short-season annual grasses (fig. 11).

This complex has low potential for urban and recreational development because of the depth to rock, Rock outcrop, and very slow permeability. These qualities create special problems, particularly in the installation of septic tank filter fields.

This soil is in capability subclass VIIs and the Claypan Savannah range site.

61—Silawa loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands and high terraces. Individual areas are irregularly shaped and 20 to 80 acres.

Typically, the surface layer is loamy fine sand about 11 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The subsoil from 11 to 45 inches is strongly acid sandy clay loam that is yellowish red in the upper part and reddish yellow in the lower part. From 45 to 60 inches is reddish yellow loamy fine sand.

This soil is well drained. Runoff is slow to medium. Permeability is moderate. Natural fertility and organic

Figure 11.—Native vegetation on Shalba-Rock outcrop complex, 1 to 8 percent slopes, in rangeland. This soil is in the Claypan Savannah range site.

matter content are low. Available water capacity is medium. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small areas of Chazos, Padina, Tremona soils. Also included are areas of a soil which is similar to the Silawa soil but which has a surface layer of fine sandy loam. Included soils make up less than 20 percent of a mapped area.

This soil is dominantly used as native or improved pasture. Native vegetation is mainly post and blackjack oak and an understory of mid and tall grasses.

This soil has high potential for forage production, but it needs good management and proper fertilization. Improved bermudagrasses, bahiagrass, and kleingrass are well suited to this soil. This soil has medium potential for crops. The main crops are corn, watermelons, and peanuts.

This soil has high potential for urban and recreational development.

The soil is in capability subclass IIIe and the Loamy Sand range site.

62—Silawa loamy fine sand, 5 to 8 percent slopes. This deep, sloping soil is on uplands. Individual areas are irregularly shaped and 20 to 40 acres.

Typically, the surface layer is brown, neutral loamy fine sand about 12 inches thick. From 12 to 17 inches is yellowish red, slightly acid clay loam. The subsoil from 17 to 50 inches is strongly acid sandy clay loam that is red in the upper part and reddish yellow in the lower part. The underlying layer from 50 to 62 inches is strongly acid, very pale brown loamy fine sand.

This soil is well drained. Runoff is slow to medium. Permeability is moderate. Natural fertility and organic matter content are low. Available water capacity is medium. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small amounts of Chazos, Padina, and Tremona soils. Included soils make up less than 20 percent of a mapped area.

This soil is used dominantly as native or improved pasture. Native vegetation is mainly post and blackjack oak and an understory of mid and tall grasses.

This soil has high potential for forage production, but it needs additions of fertilizer. Improved bermudagrass, kleingrass, and bahiagrass are well suited to this soil. This soil has medium potential for crops. The main crops are corn, watermelon, and peanuts.

This soil has high potential for urban and recreational development. Slope is a limitation in some places.

This soil is in capability subclass IVe and the Loamy Sand range site.

63—Sumpf clay, frequently flooded. This deep, nearly level soil is on bottom lands. It is in backwater sloughs and cut-off meanders. Individual areas are long and narrow and are 50 to 300 acres. It is flooded from stream overflow each year, then most areas are ponded for 2 to 3 months. Some of the lower areas are ponded throughout the year.

Typically, the surface layer is dark brown clay about 28 inches thick. It has few, dark grayish brown mottles. From 28 to 60 inches is dark brown clay. From 60 to 75 inches is reddish brown clay. This soil is moderately alkaline and calcareous throughout.

This soil is very poorly drained. Natural fertility, organic matter content, and available water capacity are high. Permeability is very slow.

Included in some mapped areas of this soil are small amounts of Asa and Brazoria soils and a soil which is similar to this Sumpf soil but which has about 24 inches of dark clay over a stratified, loamy subsoil. Included soils make up as much as 15 percent of a mapped area.

This soil is used for pasture. Some areas have been planted to improved bermudagrass. Native vegetation is mostly water weeds, willow, cottonwood, water locust, sycamore, and ash. This soil is not suited to crops because of the hazard of flooding; however, it can be cultivated if it is drained.

Most areas are used by wildlife. Large numbers of ducks spend the winter months in these areas. In some areas the holes that have retained water for several years maintain fish.

This soil has very low potential for most recreational uses because of wetness and high shrink-swell properties. Flooding is a limitation for urban development.

This soil is in capability subclass VIw and the Clayey Bottomland range site.

64—Tabor fine sandy loam, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are irregularly shaped and are 15 to 40 acres.

Typically, the surface layer is light gray, moderately alkaline fine sandy loam about 13 inches thick. The subsoil from 13 to 52 inches is clay mottled with grays, reds, browns, and yellows. This layer is medium acid in the upper part and moderately alkaline in the lower part. The underlying layer from 52 to 80 inches is mottled light gray, light yellowish brown, and yellowish red, moderately alkaline clay.

This soil is moderately well drained. Runoff is slow to medium. Permeability is very slow. Natural fertility and organic matter content are low. Available water capacity is high. The hazard of water erosion is moderate.

Included in some mapped areas of this soil are small amounts of Axtell, Chazos, and Crockett soils, and some small amounts of Tabor fine sandy loam that has 5 to 8 percent slopes. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly as pasture and rangeland. (fig 12).

The soil has high potential for forage production, but it needs good management and additions of lime and the proper fertilizer. Improved bermudagrasses, kleingrass, and bahiagrass are well suited to this soil. This soil has low potential for crops.

This soil has low potential for most urban and

Figure 12.—Cattle grazing Coastal bermudagrass on Tabor fine sandy loam, 1 to 5 percent slopes.

recreational development. Shrink-swell properties and very slow permeability are limitations.

This soil is in capability subclass IVe and the Sandy Loam range site.

65—Tabor very gravelly fine sandy loam, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are elongated and 20 to 300 acres.

Typically, the surface layer is very pale brown, slightly acid very gravelly fine sandy loam about 16 inches thick. The subsoil from 16 to 40 inches is mottled brownish yellow, light brownish gray, and yellowish red clay that is medium acid. The underlying layer from 40 to 52 inches is white, neutral clay.

This soil is moderately well drained. Runoff is medium. Permeability is very slow. Natural fertility and organic matter content are low. Available water capacity is medium. The hazard of water erosion is slight.

Included in some mapped areas of this soil are small amounts of the Tabor fine sandy loam and some small amounts of the sloping Burlewash very gravelly fine sandy loam. A soil which is similar to the Tabor soil but which has a surface layer of very gravelly fine sandy loam more than 20 inches thick is on narrow ridges. The included soils make up as much as 15 percent of a mapped area.

This soil is used for pasture and rangeland. Some areas are used only as a source of gravel.

This soil has low potential for pasture and rangeland. It is difficult to establish grasses because of the very gravelly surface layer; however, medium yields of forage can be obtained if grasses are fertilized after they are established. This soil is not suited to crops.

This soil has low potential for most urban and recreational development. Gravel, very slow permeability, and shrink-swell properties are limitations.

This soil is in capability subclass VIs and the Gravelly range site.

66—Tremona loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Individual areas are irregularly shaped and are 20 to 100 acres.

Typically, the surface layer is brown loamy fine sand about 28 inches thick. It is brown in upper part and very

pale brown in the lower part. The upper part of the subsoil from 28 to 31 inches is mottled light gray and brownish yellow sandy clay loam. From 31 to 48 inches is light gray clay mottled with red and strong brown. The lower part of the subsoil from 48 to 63 inches is mottled very pale brown, red, and reddish yellow sandy clay loam. This soil is typically medium acid in the upper part and very strongly acid in the lower part.

This soil is somewhat poorly drained. A perched water table is in the upper part following heavy rains. Runoff is slow. Permeability is very slow. Natural fertility and organic matter content are low. Available water is medium. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small amounts of Chazos, Padina, and Silawa soils, which make up as much as 15 percent of most mapped areas.

This soil is used dominantly for native rangeland or improved pasture.

This soil has high potential for forage production, but it needs proper management and additions of fertilizer. Improved bermudagrass and bahiagrass are well suited to this soil. This soil has medium potential for crops. The main crops are watermelons, corn, and peanuts.

This soil has low potential for most urban and recreational development. Wetness, shrink-swell properties, and very slow permeability are limitations.

This soil is in capability subclass IIIe and the Sandy range site.

67—Tremona loamy fine sand, 5 to 8 percent slopes. This deep, sloping soil is on uplands. Individual areas are irregularly shaped and are 20 to 80 acres.

Typically, the surface layer is yellowish brown, very strongly acid loamy fine sand about 16 inches thick. From 16 to 22 inches is light yellowish brown, slightly acid loamy fine sand. The upper part of the subsoil from 22 to 45 inches is mottled light brownish gray, brownish yellow, and red clay that is medium acid. The lower part of the subsoil from 45 to 60 inches is light brownish gray, strongly acid clay that has brownish yellow and red mottles.

This soil is somewhat poorly drained. A perched water table is in the upper part following heavy rains. Runoff is slow. Permeability is very slow. Natural fertility and organic matter content are low. Available water capacity is medium. The hazard of water erosion is severe.

Included in some mapped areas of this soil are small amounts of Padina and Silawa soils, which make up as much as 15 percent of some mapped areas.

This soil is used dominantly as rangeland or improved pasture. Forage production is high, but the soil needs good management and fertilization. Improved bermudagrasses and bahiagrass are well suited to the soil. This soil has low potential for crops. The main crops are watermelons, corn, and peanuts.

This soil has low potential for urban and recreational development. Wetness, shrink-swell properties, and very slow permeability are limitations.

This soil is in capability subclass IVe and the Sandy range site.

68—Trinity clay, occasionally flooded. This deep, nearly level soil is on bottom lands. Individual areas are somewhat elongated and 30 to 60 acres. This soil is flooded for brief to long periods 1 year out of about 8 to 10 years.

Typically, the surface layer is very dark grayish brown clay about 13 inches thick. From 13 to 49 inches is very dark gray clay. The underlying layer from 49 to 65 inches is dark reddish brown clay. The soil is calcareous and moderately alkaline throughout.

This soil is somewhat poorly drained. Runoff and permeability are very slow. Natural fertility, organic matter content, and available water capacity are high. The hazard of water erosion is slight.

Included in some mapped areas of this soil are small amounts of Brazoria and Kaufman soils, which make up as much as 15 percent of some mapped areas.

This soil is used dominantly for crops.

The soil has high potential for crop production with proper fertilization. Grain sorghum and other improved grasses are well suited to this soil.

Flooding, wetness, and shrink-swell properties are limitations for both urban and recreational development.

This soil is in capability subclass IIw and the Clayey Bottomland range site.

69—Trinity clay, frequently flooded. This deep, nearly level soil is on bottom lands. Individual areas are long and narrow and are 50 to 1,000 acres. The soil is flooded for brief to long periods 1 to 2 times each year.

Typically, the surface layer is dark gray clay about 39 inches thick. The underlying layer from 39 to 80 inches is very dark clay. The soil is calcareous and moderately alkaline throughout.

This soil is somewhat poorly drained. Runoff and permeability are very slow. Natural fertility, organic matter content, and available water capacity are high. The hazard of water erosion is slight.

Included in some mapped areas of this soil are small amounts of Kaufman soils. Two soils that are similar to the Trinity soil except one is less clayey and the other has brown colors are also included. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly as pasture because it is frequently flooded.

The soil has high potential for forage production. It is well suited to common bermudagrass, kleingrass, and native grasses. This soil is not suited to crops because of the hazard of flooding.

Flooding, wetness, and shrink-swell properties are limitations for both urban and recreational development.

This soil is in capability subclass Vw and the Clayey Bottomland range site.

70—Trinity clay, depressional. This deep, nearly level soil is in depressional areas on bottom lands.

Individual areas are elongated and are 20 to 80 acres. This soil is covered by water for 2 to 3 months each year.

Typically, the surface layer is very dark gray clay about 34 inches thick. From 34 to 50 inches is mottled very dark gray, dark brown, and brown clay. From 50 to 65 inches is reddish brown clay. The soil is calcareous and moderately alkaline throughout.

The soil is ponded. Permeability is very slow. Natural fertility, organic matter content, and available water capacity are high. The hazard of water erosion is slight.

Included in some mapped areas of this soil are small amounts of Brazoria soils, which make up as much as 15 percent of some mapped areas.

This soil is used dominantly as pasture. It has high potential for forage production if it is drained. Improved bermudagrass and kleingrass are well suited to this soil. The soil is not suited to crops because of the hazard of flooding.

The flood hazard, wetness, and shrink-swell properties are limitations for both urban and recreational development.

This soil is in capability subclass Vw and the Clayey Bottomland range site.

71—Wilson clay loam, 0 to 1 percent slopes. This deep, nearly level soil is on terraces and uplands. Individual areas are oval to elongated and are 15 to 100 acres.

Typically, the surface layer is very dark gray clay loam about 7 inches thick. The subsoil from 7 to 42 inches is dark gray clay. The underlying layer from 42 to 60 inches is pale yellow silty clay loam. This soil is typically neutral in the upper part, and it is calcareous and moderately alkaline in the lower part.

This soil is somewhat poorly drained. Runoff is very slow. Permeability is very slow. Natural fertility and organic matter content are medium. Available water capacity is high. The hazard of water erosion is slight.

Included in some mapped areas of this soil are small areas of Crockett, Lufkin, and Mabank soils. Included soils make up less than 15 percent of a mapped area.

This soil is used dominantly as pasture.

This soil has high potential for forage production, but it needs proper management and additions of fertilizer. Improved bermudagrass, kleingrass, and bahiagrass are well suited to this soil. This soil has medium potential for crops. The main crops are corn and cotton.

This soil has low potential for most urban and recreational development. Shrink-swell properties, wetness, and very slow permeability are limitations.

This soil is in capability subclass IIIw and the Claypan Prairie range site.

72—Wilson clay loam, 1 to 3 percent slopes. This deep, gently sloping soil is on terraces and uplands. Individual areas are oval to somewhat elongated and are 15 to 100 acres.

Typically, the surface layer is dark gray, slightly acid clay loam about 4 inches thick. The upper part of the subsoil from 4 to 25 inches is dark gray slightly acid clay. From 25 to 41 inches is light gray, slightly acid clay. The lower part of the subsoil from 41 to 60 inches is white, moderately alkaline silty clay loam.

This soil is somewhat poorly drained. Runoff is medium. Permeability is very slow. Natural fertility, organic matter content, and available water capacity are medium. The hazard of water erosion is moderate.

Included in some mapped areas of this soil are small amounts of soil which is similar to the Wilson soil but which has a brownish or reddish mottled subsoil and small areas of Crockett, Frelsburg, Lufkin, and Mabank soils. Also included are areas of Wilson clay loam, 0 to 1 percent slopes, and some small areas of eroded Wilson soils. Included soils make up less than 20 percent of any mapped area.

This soil is used dominantly as pasture. Some areas are in crops.

This soil has high potential for forage production, but it needs proper management and additions of fertilizer. Improved bermudagrasses, kleingrass, and bahiagrass are well suited to this soil. This soil has medium potential for crops. The main crops are corn and cotton.

This soil has low potential for most urban and recreational development. Shrink-swell properties and low strength, which affects roads and streets, are limitations.

This soil is in capability subclass IIIe and the Claypan Prairie range site.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

General management needed for crops and pasture is suggested in this section. The pasture plants best suited to the soils are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Crops. More than 240,000 acres in the survey area was used for crops and pasture in 1967 according to the Conservation Needs Inventory (*3*). Of this total, 170,000 acres was used for permanent pasture; 29,000 acres for row crops; 3,000 acres for close-growing crops; and 25,000 acres for hay. The rest was idled cropland.

Some soils in Washington County have high potential for increased production of food. These include the dark clayey soils on uplands and those along the Brazos River (see general soil map units 1, 2, 10). The rest of the county has medium to low potential for croplands because the soils are too sloping to be cultivated without using intensive soil conservation measures. Some are low in natural fertility, and some have very slow permeability.

The acreage planted to crops has gradually been decreasing as more and more land is used for pasture. The use of this soil survey to help make land use decisions that will influence the future role of farming in the survey areas is discussed in the section "General soil map units."

Soil erosion is a concern on most of the cropland and pasture in Washington County. If slope is more than 2 percent, erosion is a hazard; however, some soils that have slopes of up to 8 percent can be cultivated with proper treatment.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, such as Tabor, Crockett, Wilson, Mabank, and Chazos soils. In many sloping fields, tilling or preparing a good seedbed is difficult on clayey or hardpan spots because the orginal, friable surface soil has been eroded away. Such spots are common in areas of Frelsburg, Latium, Crockett, and Mabank soils. Second, soil erosion on farmlands results in sediment entering streams. Controlling erosion minimizes the pollution of streams by sediment and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

Erosion control measures provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetative cover on the soil for

extended periods can hold soil erosion losses to amounts that do not reduce the productive capacity of the soils. On livestock farms, which require pasture and hay, the legume and grass forage crops in the cropping system reduce erosion on sloping soils and provide nitrogen and improve tilth for the following crop.

Terraces and diversions reduce the length of slope and reduce runoff and erosion. Some soils are less suitable for terraces and diversions because of irregular slopes, excessive wetness in the terrace channels, or bedrock at a depth of less than 40 inches.

Information on designing erosion control measures for each kind of soil is available from local offices of the Soil Conservation Service.

Drainage is a major management need of soils on bottom lands used for crops and pasture. In the Brazoria, Belk, and Trinity soils, wetness causes lower production of crops.

Soil fertility is naturally low in most soils on uplands in the county. The soils on flood plains, such as Trinity, Brazoria, Belk, Norwood, Clemville, and Oklared soils, are moderately alkaline and are naturally higher in plant nutrients than most soils on uplands. The addition of organic matter and fertilizer is needed on most upland soils.

The Falba, Burlewash, and Lufkin soils on uplands are very strongly acid in their natural state. The application of ground limestone may be required to raise the pH level sufficiently for good growth of grasses and other crops. On all soils additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils that have good tilth are granular and porous.

Most of the soils used for crops in the survey area have a surface layer that is light in color and low in content of organic matter. Generally, the structure of such soils is weak, and intense rainfall causes the formation of a crust on the surface. When dry, the crust is hard and nearly impervious to water. Once the crust forms, it reduces infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material can help improve soil structure and reduce crust formation.

Pasture. Pasture is important in Washington County because raising livestock is the major farm enterprise. For the past several years the trend has been to convert land from cropland to pasture and hayland. Land used for pasture and hay usually is planted to introduced grasses that respond to good management. Among the important grasses are Coastal bermudagrass, common bermudagrass, King Ranch bluestem, kleingrass, Gordo bluestem, and bahiagrass. Hayland consists of improved bermudagrasses and introduced forage sorghums. This pasture and hayland is used mainly in combination with temporary pastures to provide year-round grazing.

Improved bermudagrasses, such as Coastal bermudagrass, are best suited to deep soils; however, they are adapted to most of the soils in which a good seedbed can be prepared. Kleingrass and Gordo bluestem are best suited to the clayey, dark, alkaline soils, such as the Bleiblerville and Frelsburg soils (see general soil map unit 1). King Ranch bluestem is suited to most of the soils in the county. Bahiagrass is better suited to some of the wetter, acid soils, such as Lufkin, Mabank, Wilson, Falba, and Burlewash soils, and to some of the soils on bottom lands, such as Nahatache and Gowen soils (see general soil map units 7 and 8).

Good management practices for pasture include fertilization, rotational grazing to maintain proper grazing height of plants, and weed and brush management. A few soils in the northern part of the survey area need additions of lime (see general soil map units 7, 8). Good management practices for hay include fertilization and harvesting the forage at the proper stage of growth.

Latest information and suggestions on pasture production can be obtained from the local offices of the Cooperative Extension Service and the Soil Conservation Service.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the

Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland and engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

rangeland

Rangeland is of moderate importance in Washington County. About 20 percent of the county, according to the 1967 Conservation Needs Inventory, is in range (*3*). The clayey soils are most highly productive and most utilized for range. Many areas that are in native post oak and grasses are used for wildlife and only a limited amount of livestock grazing. This trend is increasing.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 7 shows, for each soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as or are suited to rangeland are listed. Explanation of the column headings in table 7 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below

average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre reduced to a common percent of air-dry moisture.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, reduction of undesirable brush species, conservation of water, and control of water erosion and soil blowing. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

recreation

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Jerry Turrentine, biologist, Soil Conservation Service, assisted in preparing this section.

Washington County was originally inhabited by buffalo, prairie chicken, antelope, and other prairie species.

Numerous wooded corridors were along streams, which provided edge habitat for deer, turkey, quail, and other species. Washington County has been intensively farmed from the time of settlement. Habitat for many species was lost with intensive farming. Dove, squirrel, and quail are the most numerous game species today. Deer are found in areas where adequate cover is available. Interest in wildlife management is high among many of the present landowners and efforts to maintain or create habitat are increasing.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are sorghum, wheat, oats, and corn.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are lovegrass, johnsongrass, orchardgrass, vetch, peas, and clover.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, indiangrass goldenrod, beggarweed, pokeweed, patridgepea, panicum, paspalum, fescue, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, and hickory. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are oak, mulberry, hackberry, pecan, elm, hickory, dogwood, persimmon, sumac, plum, blackberry, grape, blackhaw, honeysuckle, dewberry, and greenbriar.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are youpan, American beautyberry, poison-ivy, and huisache.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are beaver ponding, waterfowl feeding areas, ponds, wildlife watering developments, and sloughs.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, dove, meadowlark, field sparrow, killdeer, gray fox, jackrabbit, cottontail, skunk, and coyote.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, opossum, rabbits, crows, bobcat, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, rails, kingfishers, mink, nutria, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include white-tailed deer, jackrabbit, meadowlark, bobwhite quail, and dove.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for

dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and that overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on

the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and

fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a

cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 17.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 17.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

soil and water features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse

texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

engineering test data

Table 17 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil series and their morphology." The soil samples were tested by Texas State Department of Highways and Public Transportation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Specific gravity (Particle index) - T 100 (AASHTO), D 653 (ASTM); Shrinkage—T 92 (AASHTO), D 427 (ASTM).

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*5*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 18, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquents (*Hapl*, meaning minimal horizonation, plus *aquent*, the suborder of the Entisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, nonacid, mesic Typic Haplaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*4*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*5*). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Arol series

The Arol series consists of moderately deep, loamy soils that are somewhat poorly drained. These soils are on uplands. They formed in tuffaceous clays. Slopes range from 1 to 5 percent.

Typical pedon of Arol fine sandy loam, 1 to 5 percent slopes; from the intersection of U.S. Highway 290 and Farm Road 1948 east of Burton, northwest on Farm Road 1948 for 4.2 miles to Rehburg Church, 1.2 miles north on Farm Road 1948, and 800 feet east; in pasture.

A1—0 to 8 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable; medium acid; abrupt wavy boundary.

B2tg—8 to 32 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; weak moderate subangular blocky structure; extremely hard, extremely firm, very sticky and very plastic; thin patchy clay films on faces of peds; slightly acid; gradual wavy boundary.
Cr—32 to 40 inches; light gray (5Y 7/2) clayey tuff; massive; extremely hard, extremely firm, can be cut with a spade; calcareous; moderately alkaline.

The solum ranges from 20 to 40 inches in thickness. When wet, it has chroma of 2 or less. The COLE *(coefficient of linear extensibility)* may exceed 0.09 in the Bt horizon; however, the potential linear extensibility is less than 6 cm. The Bt horizon cracks during dry seasons.

The A horizon is dark gray or light brownish gray. It is hard and massive when the soil is dry. Reaction is medium acid or strongly acid. The boundary between the A and Bt horizons is abrupt and wavy.

The Btg horizon is black, very dark gray, dark gray, or very dark grayish brown. It is clay. Clay content ranges from 40 to 50 percent. The reaction of the Btg horizon ranges from medium acid to mildly alkaline. The lower boundary is clear to gradual.

If present, the B3ca horizon contains calcium carbonate concretions at the contact between the Btg horizon and the Cr horizon.

The Cr horizon is light gray, brown, or light olive gray clayey tuff, tuffaceous clays, ash beds, or slightly cemented sandstone. The reaction ranges from medium acid to moderately alkaline.

Asa series

The Asa series consists of deep, loamy soils that are well drained. These soils are on bottom lands of the Brazos River. They formed in calcareous, reddish, stratified loamy and silty alluvium. Slopes range from 0 to 1 percent.

Typical pedon of Asa silt loam, 0 to 1 percent slopes; from intersection of farm road 1370 and farm road 2726 about 3.0 miles south of Washington, 1.5 miles southeast on farm road 1370, 1.2 miles east on a private road, and 200 feet north; in a cultivated field.

A1—0 to 9 inches; brown (7.5YR 5/2) silt loam, dark brown (7.5YR 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable; common worm casts; moderately alkaline; abrupt smooth boundary.
A12—9 to 19 inches; dark reddish gray (5YR 4/2) silt loam, dark reddish brown (5YR 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable; common worm casts of brownish material from below; moderately alkaline; clear smooth boundary.
B21—19 to 28 inches; reddish brown (5YR 4/4) silt loam, dark reddish brown (5YR 3/4) moist; weak coarse prismatic structure; slightly hard, friable; common worm casts of grayish material from above; moderately alkaline; clear smooth boundary.
B22—28 to 49 inches; yellowish red (5YR 5/6) loam, (5YR 5/8) when crushed; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; moderately alkaline; clear wavy boundary.
C1—49 to 73 inches; reddish yellow (5YR 6/6) silt loam, yellowish red (5YR 4/6) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; common films and threads of soft calcium carbonate, few calcium carbonate concretions; calcareous; moderately alkaline; clear wavy boundary.
C2—73 to 80 inches; yellowish red (5YR 5/8) silty clay loam, yellowish red (5YR 4/8) moist; weak coarse prismatic structure; hard, firm; few to common calcium carbonate concretions; calcareous; moderately alkaline.

The solum ranges from 35 to 50 inches in thickness. Organic matter decreases irregularly in the lower part of the solum. The solum ranges from loam to silty clay loam. It is 18 to 35 percent clay, more than 50 percent silt, and less than 15 percent fine and coarse sand.

The A horizon is very dark grayish brown, brown, dark reddish gray, and dark brown silt loam. Reaction ranges from neutral to moderately alkaline. Typically, this horizon is noncalcareous.

The B2 horizon is brown, reddish brown, and yellowish red. It is loam, silt loam, or silty clay loam.

The C horizon is stratified browns and reddish browns. It is very fine sandy loam, silt loam, or silty clay loam that has thin strata of clay and sand.

These soils are taxadjuncts to the Asa series because they do not have free carbonates in the B horizon; however, use and management are similar.

Axtell series

The Axtell series consists of deep, loamy soils that are moderately well drained. These soils are on uplands. They formed in acid to alkaline clays and sandy clays that are interbedded with sandier materials. Slopes range from 1 to 12 percent.

Typical pedon of Axtell fine sandy loam, 1 to 5 percent slopes; from intersection of U.S. Highway 290 and Texas Highway 105 in Brenham, 12 miles northeast on Texas Highway 105, 1 mile north on a county road to its intersection with another county road and 70 feet southwest of intersection; in pasture.

A1—0 to 6 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; hard, friable; common fine roots; a thin bleached layer is in the lower part; slightly acid; abrupt wavy boundary.
B21t—6 to 17 inches; mottled yellowish red (5YR 5/6) and grayish brown (10YR 5/2) clay; moderate

medium angular blocky structure; extremely hard, very firm; common fine roots; common thick clay films on peds; strongly acid; clear wavy boundary.
B22t—17 to 30 inches; mottled yellowish red (5YR 5/6) and light brownish gray (10YR 6/2) clay; weak coarse angular blocky structure; extremely hard, very firm; few fine roots; common thick clay films on peds; strongly acid; clear wavy boundary.
B23t—30 to 46 inches; mottled red (2.5YR 4/8), yellowish red (5YR 5/8), and pale brown (10YR 6/3) clay loam; weak coarse angular blocky structure; extremely hard, very firm; few patchy clay films; slightly acid; clear wavy boundary.
B3—46 to 62 inches; mottled light yellowish brown (10YR 6/4) and light gray (10YR 7/2) sandy clay loam; weak moderate subangular blocky structure; hard, firm; moderately alkaline.

The solum ranges from 50 inches to more than 80 inches in thickness.

The A horizon is brown, red, yellowish red, and reddish yellow.

The B21t horizon of most pedons has mottles with chroma of 2 or less. Texture of the B21t horizon is clay or sandy clay. Reaction is strongly acid. The lower part of the B2t horizon is in shades of red, brown, yellow, and gray. Texture is clay, sandy clay, or clay loam, and the horizon is more than 35 percent clay.

The B3 horizon is in shades of red and yellow. Some pedons have gray mottles. Texture of the B3 horizon is sandy clay loam or clay loam.

Belk series

The Belk series consists of deep, clayey soils that are well drained. These soils are on bottom lands. They formed in stratified, alkaline, loamy sediments. Slopes range from 0 to 1 percent.

Typical pedon of Belk clay, 0 to 1 percent slopes; from the intersection of Farm Road 2726 and Farm Road 1155 about 17 miles northeast of Brenham, 1.8 miles east of Farm Road 2726, 1.3 miles east on a county road, 0.3 mile south on a private road, 2.4 miles south on field road to barn in an open field, and 300 feet northwest.

Ap—0 to 4 inches; reddish brown (5YR 5/3) clay, reddish brown (5YR 4/3) moist; weak fine granular structure parting to subangular blocky; hard, firm, very sticky; common fine roots; calcareous; moderately alkaline; clear smooth boundary.
B2—4 to 25 inches; reddish brown (5YR 5/3) clay, reddish brown (5YR 4/3) moist; moderate medium angular blocky structure; extremely hard, very firm, very sticky; shiny surfaces on peds; calcareous; moderately alkaline; abrupt wavy boundary.
IIAb—25 to 41 inches; dark brown (7.5YR 4/2) silt loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable; weakly calcareous; moderately alkaline; clear wavy boundary.
IIBb—41 to 62 inches; brown (7.5YR 5/4) silty loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable; calcareous; moderately alkaline.

The solum and underlying layers are moderately alkaline and calcareous throughout in most pedons; however, some have noncalcareous IIAb and IIBb horizons. The A and B2 horizons range from 20 to 32 inches in combined thickness.

The A horizon is dark reddish brown or reddish brown. In some pedons it is thin and has value and chroma of less than 3.5 when moist.

The B2 horizon is reddish brown clay or silty clay and is 40 to 60 percent clay.

The IIAb horizon is very dark gray, dark brown, or very dark grayish brown. Texture is silty clay loam or silt loam. Some pedons do not have this horizon.

The IIBb horizon is brown, dark reddish brown, reddish brown, or yellowish red. Texture is silt loam, silty clay loam, or fine sandy loam.

Bleiblerville series

The Bleiblerville series consists of deep, calcareous, clayey soils that are moderately well drained. These soils are nearly level and gently sloping and are on uplands. They formed in calcareous clays and marls. Slopes range from 1 to 5 percent.

Typical pedon of Bleiblerville clay, 1 to 3 percent slopes (fig. 13); from intersection of U.S. Highway 290 and Farm Road 1155 Chappell Hill, 1.1 miles east on U.S. Highway 290, 1.25 miles south on Farm Road 1371, 0.2 mile west in hayfield; pedon is midway between a microknoll and a microdepression.

A1—0 to 33 inches; very dark gray (10YR 3/1) clay, very dark gray (10YR 3/1) moist; moderate medium angular blocky structure; extremely hard, very firm, very sticky and plastic; many fine roots; common fine pores; granular mulch 1/2-inch thick on surface, intersecting slickensides begin at 8 inches, are tilted 45 degrees from horizontal, and are up to 3 feet wide and 7 feet long; cracks 2 inches wide at the surface extend through the horizon; 9 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual wavy boundary.
A12—33 to 63 inches; dark gray (10YR 4/1) clay, dark gray (10YR 4/1) moist; moderate medium angular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; few fine pores; large slickensides tilted 45 degrees from the horizontal continue through this horizon; cracks extend to a depth of 50 inches; vertical streaks of very dark gray material in old cracks; 11 percent

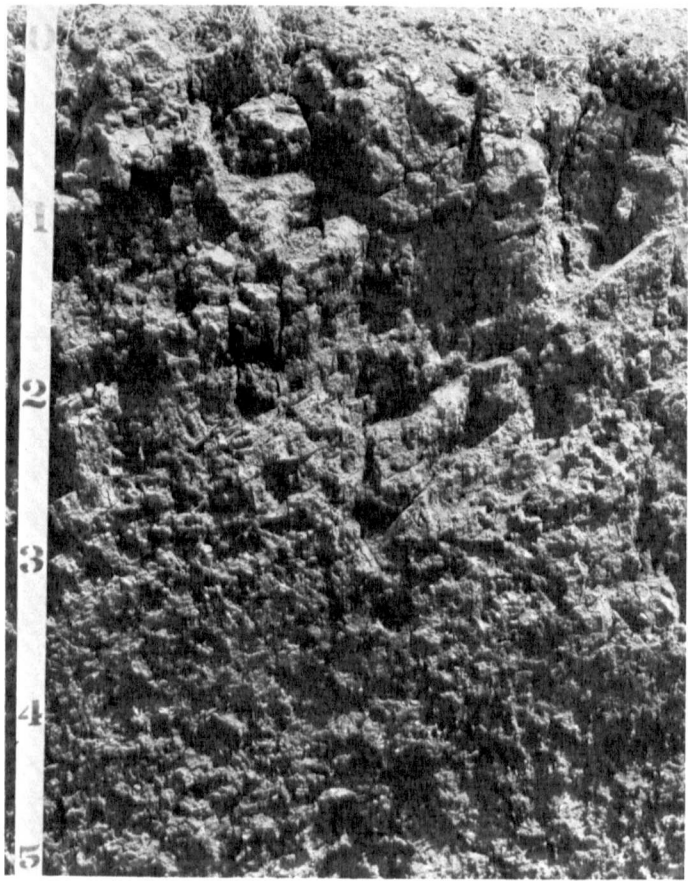


Figure 13.—Profile of Bleiblerville clay, 1 to 3 percent slopes. Deep cracking is caused by shrink-swell properties.

calcium carbonate equivalent; calcareous; moderately alkaline; abrupt wavy boundary.

AC—63 to 75 inches; pale yellow (2.5Y 8/4) clay, pale yellow (2.5Y 7/4) moist; common fine prominent dark gray mottles; weak fine subangular blocky structure; extremely hard, very firm, sticky and plastic; few fine pores; common large slickensides; dark gray coatings on faces of slickensides; few fine concretions of calcium carbonate; 38 percent calcium carbonate equivalent; calcareous; moderately alkaline.

Cycles of microdepressions and microknolls are repeated each 5 to 10 feet. In areas of native vegetation microknolls are 4 to 16 inches higher than microdepressions. When dry, the surface has a granular mulch about one-half inch thick, and cracks that are up to 3 inches wide at the surface extend to a depth of about 50 inches.

The A and AC horizons range from about 60 inches to more than 100 inches in combined thickness. Intersecting slickensides begin 8 to 15 inches below the surface. Slickensides range up to several feet across and are tilted 40 to 60 degrees from the horizontal. Slickensides that have greater angles are near the microknolls. Texture is mainly clay. Some pedons are silty clay. Clay content ranges from 45 to 60 percent.

The A horizon is black, very dark gray, dark gray, and gray. Most pedons have vertical streaks of darker material extending through the solum in old, filled cracks. The A horizons which have value of 5.5 or less (dry) and 3.5 or less (moist) and which have chroma of 1.5 or less range in thickness from 4 to 22 inches in the microknolls and from 20 to 60 inches in microdepressions. The A horizon is more than 12 inches thick in more than 50 percent of the pedon. The extremes in depth of the boundary between the A and AC horizons are about 15 inches at the center of the microknoll to 55 inches at the center of the microdepression. Most of the soil is calcareous throughout, but some of the soil is noncalcareous in depressions.

The AC horizon is pale yellow, light gray, very pale brown, grayish brown, and light yellowish brown. Prominent mottles of gray, yellow, and brown range from none to common. Few to common, medium, soft masses or concretions of calcium carbonate are present in the lower part. Black concretions range from none to few.

The C horizon, which is at a depth of less than 80 inches in some pedons, is brownish yellow and olive yellow mottled with gray. It is calcareous clay and marl.

Bosque series

The Bosque series consists of deep, loamy soils that are well drained. These soils are on bottom lands. They formed in calcareous, loamy sediments. Slopes range from 0 to 1 percent.

Typical pedon of Bosque clay loam, frequently flooded; from intersection of Farm Road 577 and U.S. Highway 290 east of Brenham, east on U.S. Highway 290, 0.8 mile, south and east on county road for 2.6 miles, and east 1.8 miles; 800 feet east of pond in a pasture.

Ap—0 to 22 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium angular blocky structure; slightly hard, friable; many fine roots; common pores; common worm casts; calcareous; moderately alkaline; clear smooth boundary.

B2—22 to 40 inches; mottled grayish brown (10YR 5/2) loam, pale brown (10YR 6/3) and very pale brown (10YR 7/3) moist; fine granular structure; soft, very friable; calcareous; moderately alkaline; clear smooth boundary.

IIBb—40 to 62 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure; hard, firm; calcareous; moderately alkaline.

The solum ranges from 40 to 60 inches in thickness. The 10- to 40-inch control section is loam, clay loam, or

sandy clay loam and has clay content of 20 to 35 percent. Some pedons have buried horizons below a depth of about 40 inches. These horizons vary in texture from fine sandy loam to clay.

The A horizon is brown, dark brown, grayish brown, dark grayish brown, or very dark grayish brown. Reaction is mildly alkaline to moderately alkaline. Most pedons are calcareous, but some are noncalcareous in the upper part of the Ap horizon because of recent deposition of overwash sediments.

The B horizon is brown, pale brown, very pale brown, grayish brown, or light brownish gray. Mottling ranges from none to common in shades of yellow or brown. Texture is clay loam, loam, or sandy clay loam. Reaction is mildly alkaline to moderately alkaline.

The IIB horizon is calcareous and moderately alkaline.

Brazoria series

The Brazoria series consists of deep, clayey soils that are somewhat poorly drained. These soils are on bottom lands. They formed in alkaline, clayey alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Brazoria clay, 0 to 1 percent slopes; from Brenham, 9 miles east on U. S. Highway 290, 5.5 miles north and east on Farm Road 2447, and 150 feet north; in dense stand of hardwoods.

A11—0 to 3 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; hard, firm; calcareous; moderately alkaline; clear smooth boundary.

A12—3 to 15 inches; dark reddish gray (5YR 4/2) clay, dark reddish brown (5YR 3/2) moist; moderate medium subangular blocky structure; very hard, very firm; calcareous; moderately alkaline; clear wavy boundary.

B21—15 to 28 inches; dark reddish gray (5YR 4/2) clay, reddish brown (5YR 4/3) moist; moderate medium wedge-shaped peds that are tilted 30 degrees to 60 degrees from the horizontal; very hard, very firm; calcareous; moderately alkaline; clear wavy boundary.

B22—28 to 44 inches; reddish brown (2.5YR 5/4) clay, reddish brown (2.5YR 4/4) moist; moderate medium angular blocky structure; very hard, very firm; moderate medium intersecting slickensides; few concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

IIAb—44 to 80 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak moderate subangular blocky structure; very hard, very firm; common fine concretions of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 40 to 60 inches in thickness. It is clay throughout. The clay content of the 10- to 40-inch control section is 60 to 80 percent. Calcium carbonate concretions are at a depth of 28 to 60 inches. The soil is calcareous throughout the solum. The COLE (coefficient of linear extensibility) in the upper horizons is 0.07 to 0.18.

The A horizon is brown, dark brown, dark reddish gray, or dark reddish brown. Reaction is moderately alkaline.

The B2 horizon is reddish brown, dark reddish brown, or reddish brown. Slickensides are present and intersect. Reaction is moderately alkaline.

The IIAb horizon is black, very dark gray, or dark gray clay or silty clay. Reaction is moderately alkaline. Some pedons are noncalcareous.

Some pedons have a reddish brown C or IIC horizon. The C horizon is stratified layers ranging in texture from fine sandy loam to clay or silty clay.

These soils are considered to be taxadjuncts to the Brazoria series because the mineralogy is montmorillonitic rather than mixed; however, use and management are similar.

Brenham series

The Brenham series consists of deep, loamy soils that are well drained. These soils are on uplands. They formed in calcareous, clayey sediments. Slopes range from 3 to 8 percent.

Typical pedon of Brenham clay loam, 3 to 8 percent slopes (fig. 14); from Brenham, about 16 miles northeast to intersection of Farm Road 1155 and Farm Road 2726, 1.2 miles northeast on Farm Road 2726, 0.2 mile east on county road, 0.8 mile east and south on county road, 1,200 feet southwest; in open pasture.

A1—0 to 10 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; hard, firm; many fine roots; many worm casts; 16 percent calcium carbonate equivalent; calcareous; moderately alkaline; clear smooth boundary.

B21ca—10 to 28 inches; pale yellow (2.5Y 7/4) silty clay loam, light yellowish brown (10YR 6/4) moist; common vertical streaks of very dark grayish brown (10YR 3/2); moderate fine blocky structure; hard, firm; common fine roots; common fine pores; common worm casts; few soft masses of calcium carbonate; few fine concretions of calcium carbonate; 52 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual wavy boundary.

B22ca—28 to 40 inches; pale yellow (2.5Y 7/4) silty clay loam, light yellowish brown (2.5Y 6/4) moist; moderate fine blocky structure; hard, firm; few fine roots; few fine pores; 20 percent by volume soft masses and concretions of calcium carbonate; 45 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual smooth boundary.

B23ca—40 to 48 inches; pale yellow (2.5Y 7/4) silty clay loam, light yellowish brown (2.5Y 6/4) moist;

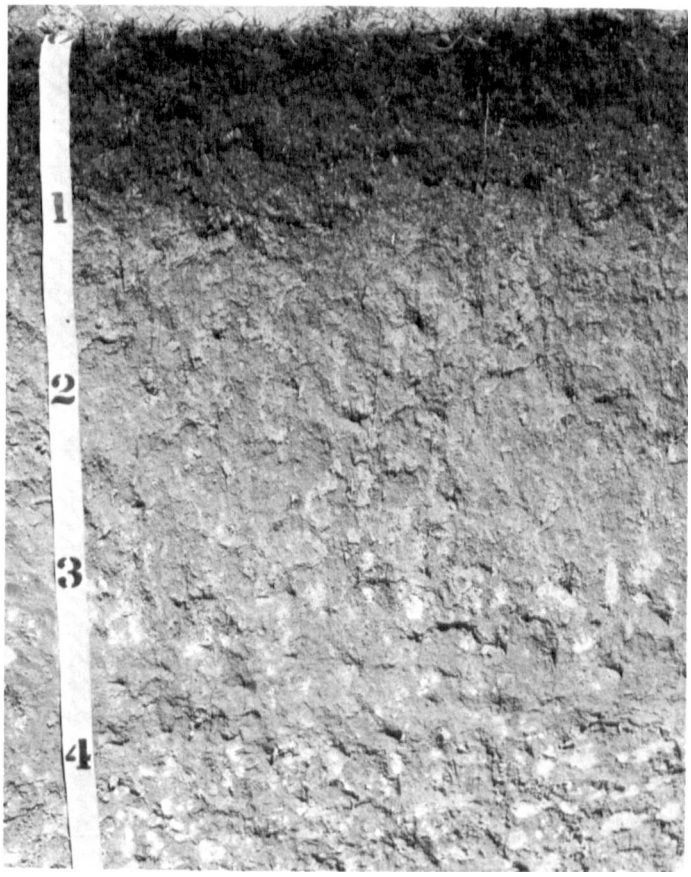


Figure 14.—Profile of Brenham clay loam, 3 to 8 percent slopes. The surface layer is dark clay loam to about 10 inches. The subsoil is silty clay loam and concretions of calcium carbonate.

moderate fine blocky structure; hard, firm; 35 percent by volume soft masses and concretions of calcium carbonate; 48 percent carbonate equivalent; calcareous; moderately alkaline; gradual smooth boundary.

IIC1ca—48 to 61 inches; yellow (10YR 7/6) clay, brownish yellow (10YR 6/6) moist; very hard, firm; about 30 percent by volume soft masses and concretions of calcium carbonate; 29 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual smooth boundary.

IIC2—61 to 80 inches; yellow (10YR 7/6) silty clay, brownish yellow (10YR 6/6) moist; grooved intersecting slickensides that form wedge-shaped peds; very hard, firm; common fine concretions of calcium carbonate; 24 percent calcium carbonate equivalent; calcareous; moderately alkaline.

The solum ranges from 40 to 60 inches in thickness. The calcic horizon is at a depth of 10 to 28 inches. Calcium carbonate equivalent of the 10- to 40-inch control section ranges from 40 percent to more than 60 percent. The soil is clay loam, silty clay loam, or clay and has a total clay content of 36 to 44 percent. Silicate clay in the 10- to 40-inch control section ranges from 20 to 35 percent. The soil is calcareous throughout.

The A horizon is very dark gray, very dark grayish brown, dark grayish brown, or grayish brown. Texture is clay loam or silty clay loam.

The B21ca and B22ca horizons are pale yellow or light yellowish brown. The B23ca horizon is pale yellow or light yellowish brown.

The C1ca and C2 horizons are yellow or brownish yellow.

Burleson series

The Burleson series consists of deep, clayey soils that are moderately well drained. These soils are on old stream terraces. They formed in alkaline, clayey sediments. Slopes range from 0 to 3 percent.

Typical pedon of Burleson clay, 0 to 1 percent slopes, from the town of Washington in the northeast part of the county, 4 miles south on Farm Road 1370 to intersection with Farm Road 2726, and 0.75 mile south on Farm Road 1370; site is 250 feet west of road in a pasture of Coastal bermudagrass.

Ap—0 to 8 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure; extremely hard, very firm, sticky and plastic; pressure faces on peds; common fine roots; neutral; clear smooth boundary.

A12—8 to 42 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium subangular blocky structure; extremely hard, very firm, sticky and plastic; common intersecting slickensides; few soft masses of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

AC—42 to 60 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate medium subangular blocky structure; extremely hard, very firm, sticky and plastic; common intersecting slickensides; few soft masses of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

IIC—60 to 70 inches; light yellowish brown (10YR 6/4) clay, yellowish brown (10YR 5/4) moist; massive; extremely hard, very firm; common concretions of calcium carbonate; black vertical streaks; calcareous; moderately alkaline.

The solum ranges from 40 inches to more than 100 inches in thickness. More than 70 percent of each pedon exceeds 48 inches in thickness. When dry, this soil has cracks which are 0.5 inch to 3 inches wide and which extend to a depth of 25 to 60 inches. Intersecting slickensides begin at a depth of 20 to 30 inches. Chroma in the matrix that is less than 1.5 extends to a depth of more than 40 inches. Texture throughout the solum is clay.

The A horizon is gray, dark gray, very dark gray, or black. Reaction is medium acid to moderately alkaline. The A horizon is noncalcareous in the matrix. It is 6 to 20 inches thick in the microknolls and 20 to 30 inches thick in the microdepressions.

The AC horizon is gray, grayish brown, dark grayish brown, light olive gray, light brownish gray, pale olive, or dark gray. Some pedons are underlain by reddish sediments of sandy material. Reaction is mildly alkaline to moderately alkaline. The AC horizon is calcareous or noncalcareous.

Burlewash series

The Burlewash series consists of moderately deep, loamy soils that are well drained. These soils are on uplands. They formed in tuffaceous material. Slopes range from 1 to 20 percent.

Typical pedon of Burlewash fine sandy loam, 1 to 5 percent slopes (fig. 15); from the town of Burton, 0.7 mile west on Farm Road 2780 to its intersection with Farm Road 1697, then 6.3 miles west on Farm Road 2780. The site is 0.2 mile west of ranch entrance, and 100 feet southwest; in pasture.

A1—0 to 6 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable; very strongly acid; abrupt smooth boundary.

B2t—6 to 21 inches; brown (7.5YR 5/2) clay, dark brown (7.5YR 4/2) moist; weak medium angular blocky structure; very hard, very firm, very sticky and very plastic; many clay films on ped faces; very strongly acid; clear smooth boundary.

B3—21 to 27 inches; brown (10YR 5/3) clay loam; dark brown (10YR 4/3) moist; few fine faint mottles of very pale brown (10YR 7/3) weak medium angular blocky structure; hard, firm, sticky and plastic; patchy clay films on ped faces; very strongly acid; clear irregular boundary.

Cr—27 to 40 inches; white (10YR 8/2) thinly bedded tuffaceous sandstone, light brownish gray (10YR 6/2) moist; few fine distinct brownish yellow (10YR 6/8) mottles, few dark brown mottles; massive; slightly hard, friable; strata of organic material throughout; very strongly acid.

The solum is from 20 to 40 inches deep to paralithic contact with tuffaceous sandstone or siltstone. Base saturation of the argillic horizon is typically about 50 percent but ranges from 35 to 75 percent. These soils are below the wilting point for 90 cumulative days in most years. The chroma of 2 is inherited from the parent material. In the Bt horizon the COLE (coefficient of linear extensibility) exceeds 0.09; however, the potential linear extensibility is less than 6 cm.

The A horizon is light brownish gray or dark grayish brown. It is 0 to 20 percent siliceous gravel. The reaction of the A horizon ranges from medium acid to very strongly acid.

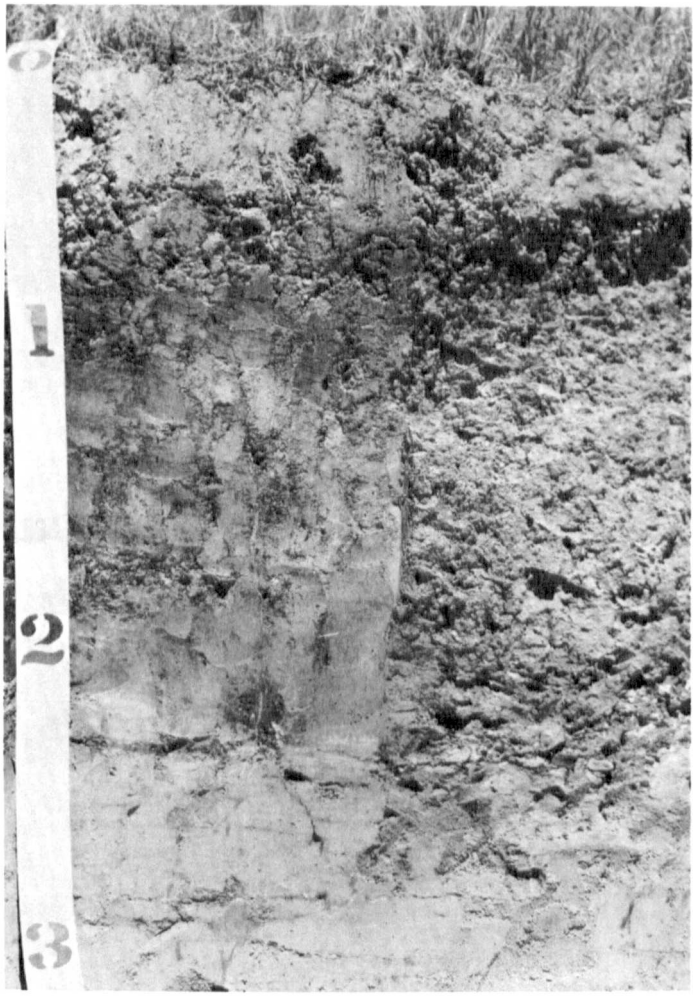


Figure 15.—Profile of Burlewash fine sandy loam, 1 to 5 percent slopes. Tuffaceous material is at a depth of about 27 inches.

The B2t horizon is brown, dark brown, reddish brown, or yellowish red. Mottles of brownish yellow or yellowish brown range from none to few. Reaction of the Bt horizon ranges from strongly acid to extremely acid.

Where present, the B3 horizon is brown or reddish brown clay, clay loam, or sandy clay loam. Mottles in shades of brown or yellow range from few to common. Reaction of the B3 horizon is very strongly acid or strongly acid.

The Cr horizon is stratified beds of tuffaceous siltstone, sandstone, tuffaceous clay, or fine sandy loam. The weathered materials range from fine sandy loam to silty clay. Color is variable, but shades of gray, brown, and yellow predominate. This horizon is somewhat brittle or weakly cemented, and restricts the penetration of

roots. The reaction of the Cr horizon is strongly acid or very strongly acid.

Carbengle series

The Carbengle series consists of moderately deep, loamy soils that are well drained. These soils are on uplands. They formed in loamy material derived from weakly cemented sandstone. Slopes range from 1 to 8 percent.

Typical pedon of Carbengle clay loam, 3 to 5 percent slopes (fig. 16); from the town of William Penn northeast of Brenham, 2 miles north on Farm Road 1935, 0.2 mile west on a county road, and 250 feet south; in native meadow.

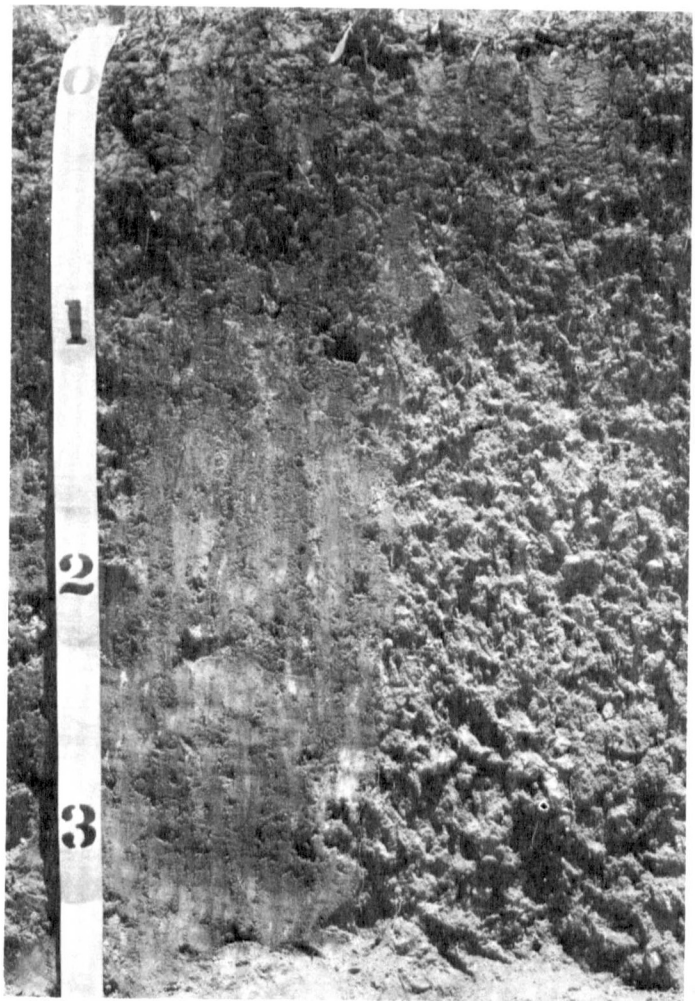


Figure 16.—Profile of Carbengle clay loam, 3 to 5 percent slopes. Concentrations of calcium carbonate are in the subsoil.

A11—0 to 7 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; weak fine granular structure; hard, friable; many fine roots; calcareous; moderately alkaline; clear smooth boundary.

A12—7 to 12 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure; hard, friable; many fine roots; many fine pores; calcareous; moderately alkaline; abrupt wavy boundary.

B2ca—12 to 23 inches; light gray (10YR 7/2) loam, light gray (10YR 7/2) moist; moderate fine and medium subangular blocky structure; hard, very friable; common fine roots; common fine pores; common soft masses of calcium carbonate; about 50 percent calcium carbonate equivalent; calcareous; moderately alkaline; clear wavy boundary.

B3ca—23 to 34 inches; white (10YR 8/2) loam, light gray (10YR 7/2) moist; weak fine and medium subangular blocky structure; hard, very friable; common fine roots; common fine pores; about 30 percent by volume of soft masses of calcium carbonate; common concretions of calcium carbonate; about 60 percent calcium carbonate equivalent; calcareous; moderately alkaline; abrupt wavy boundary.

Cr—34 to 60 inches; calcareous, weakly cemented sandstone interbedded with loamy material.

The solum is 20 to 40 inches deep to weakly cemented or cemented, calcareous sandstone interbedded with loamy material. The B horizon has secondary carbonates throughout in the form of soft masses, films, concretions, and threads. The calcium carbonate equivalent ranges from 45 percent to 65 percent. The 10- to 40-inch control section is 25 to 35 percent clay and more than 15 percent material coarser than very fine sand. The chroma of 2 is caused by the calcium carbonate. The soil is calcareous throughout.

The A horizon is very dark gray, black, or dark brown.

The B2ca horizon is light gray or very pale brown. It is loam, clay loam, or silty clay loam.

The B3ca horizon is white or very pale brown. Mottles of brownish yellow, light brownish gray, and pale yellow range from none to common. It is loam, clay loam, or silty clay loam.

The Cr horizon ranges from calcareous, weakly cemented sandstone to strongly cemented sandstone that is interbedded with loamy sediment. It can be cut with a spade or auger. Roots penetrate only into the fractures and the loamy, interbedded material.

Chazos series

The Chazos series consists of deep, sandy soils that are moderately well drained. These soils are on uplands. They formed in alkaline, clayey and loamy deposits. Slopes range from 1 to 8 percent.

Typical pedon of Chazos loamy fine sand, 1 to 5 percent slopes; from Brenham, 9.2 miles southwest on

Farm Road 389 to county road, 1.4 miles southwest on county road to Farm Road 2502, 0.9 mile southeast on Farm Road 2502, and 100 feet northeast; in pasture.

A1—0 to 6 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grained; loose; common fine roots; medium acid; clear smooth boundary.
A2—6 to 12 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grained; loose; common fine roots; medium acid; abrupt wavy boundary.
B21t—12 to 21 inches; red (2.5YR 4/6), grayish brown (10YR 5/2), and yellowish brown (10YR 5/6) clay; weak medium subangular blocky structure; extremely hard, very firm; common fine roots; common thick clay films; strongly acid; clear smooth boundary.
B22t—21 to 38 inches; mottled red (2.5YR 4/6), reddish yellow (7.5YR 6/6), and light gray (2.5Y 7/2) sandy clay; weak medium subangular blocky structure; extremely hard, very firm; common thick clay films; strongly acid; clear smooth boundary.
B3—38 to 62 inches; mottled red (2.5YR 5/8) and gray (N 6/0) sandy clay loam; moderate medium prismatic structure; hard, firm; few patchy clay films; neutral; clear smooth boundary.
C1—62 to 75 inches; white (10YR 8/2) sandy clay, light gray (10YR 7/2) moist; massive; extremely hard, very firm; mildly alkaline; abrupt smooth boundary.
C2ca—75 to 80 inches; light gray (10YR 7/2) sandy clay, light gray (10YR 7/1) moist; massive; extremely hard, very firm; 20 percent by volume soft masses of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 40 to 70 inches in thickness. The A horizon is 10 to 20 inches thick in more than 50 percent of the pedon, but it may be thinner in some pedons.

The A horizon is dark grayish brown, grayish brown, brown, light brownish gray, pale brown, light gray, or very pale brown. Texture is loamy fine sand. The reaction of the A horizon is slightly acid to medium acid. The boundary between the A and Bt horizons is abrupt.

The B2t horizon is yellowish brown, pale brown, or light gray. Mottles are in shades of red, brown, yellow, and gray. Texture of the Bt horizon is clay or sandy clay, and clay content is 35 to 50 percent. Clay films are present on ped surfaces. Reaction is strongly acid to very strongly acid.

The B3 horizon is light gray, light yellowish brown, or yellowish brown. Mottles are in shades of red, brown, yellow, and gray. Texture is clay loam or sandy clay loam. Reaction ranges from medium acid to neutral.

The C horizon is brownish yellow, light brownish gray, light gray, or yellow. Texture is sandy clay, sandy clay loam, or sandy loam. The C horizon is strongly acid through moderately alkaline. Some pedons contain up to 40 percent, by volume, soft masses of calcium carbonate.

Clemville series

The Clemville series consists of deep, loamy soils that are well drained. These soils are on bottom lands. They formed in stratified, calcareous alluvium that is silty and clayey. Slopes range from 0 to 3 percent.

Typical pedon of Clemville silt loam, 0 to 1 percent slopes; from intersection of U.S. Highway 290 and Farm Road 1155 in the town of Chappell Hill, 1.1 miles east on U.S. Highway 290, 3.5 miles south on Farm Road 1371, and 2.1 miles east and south on county road; from sharp curve in county road, the site is 0.8 mile east by a field road.

Ap—0 to 6 inches; brown (7.5YR 5/4) silt loam, dark brown (7.5YR 4/4) moist; weak fine granular structure; slightly hard, very friable; calcareous; moderately alkaline; abrupt smooth boundary.
A12—6 to 15 inches, reddish brown (5YR 5/3) silt loam, reddish brown (5YR 4/3) moist; weak medium angular blocky structure; slightly hard, very friable; calcareous; moderately alkaline; clear smooth boundary.
C1—15 to 20 inches; light brown (7.5YR 6/4) silty clay loam, brown (7.5YR 5/4) moist; massive with weak bedding planes; very hard, firm; calcareous; moderately alkaline; clear wavy boundary.
C2—20 to 28 inches; reddish brown (5YR 5/3) silty clay loam, reddish brown (5YR 5/4) moist; massive with bedding planes and a very thin stratum of silt loam; very hard, firm; calcareous; moderately alkaline; clear wavy boundary.
Ab—28 to 65 inches; reddish brown (5YR 5/3) silty clay, reddish brown (5YR 4/3) moist; moderate medium angular blocky structure; hard, firm; calcareous; moderately alkaline.

Clayey horizons are at a depth of 24 to 36 inches. The 10- to 40-inch control section averages about 25 to 35 percent clay. The soil is moderately alkaline and calcareous.

The A horizon is reddish brown or yellowish red.

The C horizon has the same colors as the A horizon. Texture is silt loam, silty clay loam, or fine sandy loam. Horizontal strata are few to many.

Buried horizons are present in some pedons. The Ab and Bb horizons range from silt loam to clay. The Ab horizon is dark reddish brown or reddish brown. It is calcareous and ranges from neutral to moderately alkaline. The Bb horizon is reddish brown or yellowish red. It is calcareous and moderately alkaline.

Crockett series

The Crockett series consists of deep, loamy soils that are moderately well drained. These soils are on uplands. They formed in alkaline clays. Slopes range from 1 to 10 percent.

A typical pedon of Crockett fine sandy loam, 1 to 5 percent slopes; from intersection of Farm Road 1370 and Farm Road 912 near the town of Washington, 2.6 miles south and east on Farm Road 1370; 0.3 mile east on a private road, and 50 feet east; in pasture.

A—0 to 7 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak subangular blocky structure; hard, friable; medium acid; abupt wavy boundary.

B21t—7 to 14 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; and common medium distinct red (2.5YR 4/6) mottles; moderate fine and medium blocky structure; thick continuous clay films; very hard, firm; slightly acid, clear wavy boundary.

B22t—14 to 26 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; and common fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8) mottles; moderate medium blocky structure; thick continuous clay films; very hard, firm; neutral; clear wavy boundary.

B23t—26 to 51 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium blocky structure; few patchy clay films; very hard, firm; mildly alkaline, clear wavy boundary.

B3—51 to 80 inches; brownish yellow (10YR 6/6) sandy clay, yellowish brown (10YR 5/6) moist; common fine distinct red (2.5YR 4/6) and strong brown (7.5YR 5/8) mottles; weak blocky structure; very hard, firm; few soft masses and few concretions of calcium carbonate; moderately alkaline.

The solum ranges from 40 inches to more than 80 inches in thickness. Depth to secondary carbonates ranges from 35 to 60 inches. The A horizon is quite variable in thickness within short distances. The boundary between the A and Bt horizons is wavy, and the textural change is abrupt.

The A horizon is 4 to 10 inches thick. It is brown, pale brown, dark grayish brown, or light brownish gray. Some pedons are 10 to 15 percent, by volume, quartz or chert pebbles. Reaction is medium acid to neutral.

The Bt horizon is 25 to 50 inches thick. Over short distances it is extremely variable in the dominant color and the degree and distinctiveness of mottling. The Bt horizon varies from a horizon prominently mottled in shades of olive, yellows, reds, and browns to a horizon with a matrix of reddish brown or grayish brown and few to common mottles. Most pedons have gray mottles in the upper part of the Bt horizon. Clay content is 40 to 55 percent. Reaction is medium acid to mildly alkaline.

The B3 horizon is 15 to 30 inches thick. It is colored dominantly in shades of olive, yellowish brown, and brownish yellow. Texture is clay or sandy clay. This horizon has few to common secondary carbonates. Reaction is mildly to moderately alkaline.

The C horizon is at a depth of less than 80 inches in some pedons. It is loam, sandy clay loam, clay, or clay loam. It has visible carbonate bodies that range from none to many. Reaction is mildly alkaline or moderately alkaline.

Cuero series

The Cuero series consists of deep, loamy soils that are well drained. These soils are on uplands. They formed in calcareous, loamy sediments and weakly cemented, calcareous sandstone. Slopes range from 1 to 8 percent.

Typical pedon of Cuero sandy clay loam, 5 to 8 percent slopes; (fig. 17) from Brenham, 12.5 miles northeast on Texas Highway 105, 0.6 mile south on a county road, 0.9 mile east on a county road to large pecan tree on east side of drain, and 100 feet south of tree; in native pasture.

A1—0 to 18 inches; very dark gray (10YR 3/1) sandy clay loam, black (10YR 2/1) moist; moderate medium angular blocky structure; slightly hard, friable, slightly sticky; common fine roots common worm casts; mildly alkaline; clear smooth boundary.

B1—18 to 25 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; slightly hard, friable, slightly sticky; few fine roots; mildly alkaline; clear smooth boundary.

B21t—25 to 38 inches; dark brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, firm, slightly sticky; few thick clay films; few fine roots; few fine concretions of calcium carbonate; few coarse pebbles; moderately alkaline; clear smooth boundary.

B22t—38 to 48 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; hard, firm, slightly sticky; few patchy clay films; few fine roots; few fine concretions of calcium carbonate; few coarse pebbles moderately alkaline; clear smooth boundary.

B3ca—48 to 60 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky; common fine concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

C—60 to 70 inches; yellowish brown (10YR 5/8) slightly brittle sandstone, yellowish brown (10YR 5/8) moist; single grained; loose; calcareous; moderately alkaline.

The solum ranges from 30 to 60 inches in thickness. The mollic epipedon is 21 to 26 inches thick. Depth to segregated calcium carbonate in the forms of threads, films, and soft masses is 30 to 36 inches.

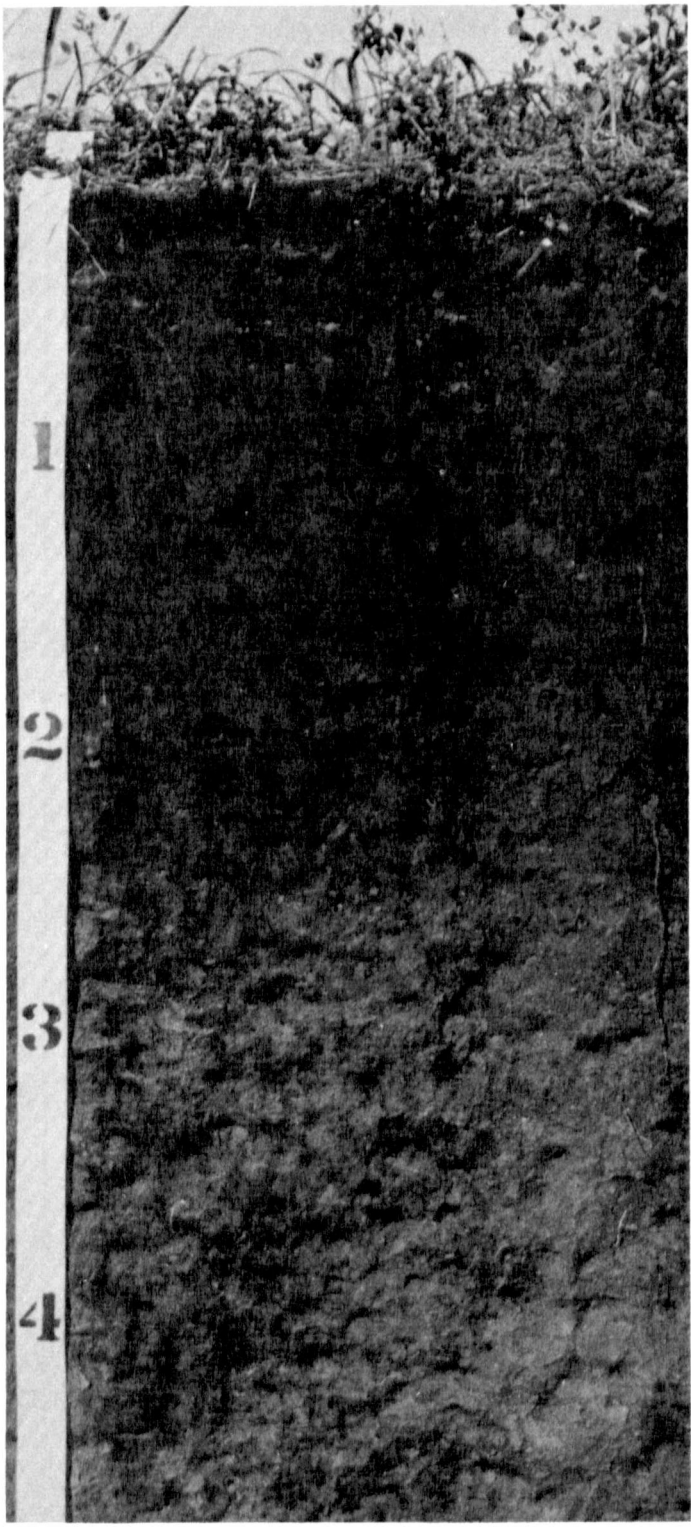


Figure 17.—Profile of Cuero sandy clay loam, 5 to 8 percent slopes, which is dark to a depth of about 25 inches and has calcium carbonate concentrations at a depth of about 48 inches.

The A horizon is very dark gray, very dark grayish brown, or dark grayish brown. Reaction is neutral to mildly alkaline. In some pedons the mollic epipedon extends down into the B21t horizon.

The B2t horizon is brown, dark brown, or reddish brown. Texture is sandy clay loam that has clay content of 25 to 35 percent. The reaction is mildly alkaline to moderately alkaline. In some pedons the B2t horizon is calcareous in the lower part.

The B3ca horizon is brown, yellowish brown, or reddish brown.

The C horizon is sandy clay loam, brittle sandstone, or fine sandy loam and fragments of calcareous sandstone. It is variable. Some pedons have a weakly cemented to moderately cemented Cca horizon as much as 12 inches thick above the C horizon.

These soils differ from those of the Cuero series in having a siliceous mineralogy rather than mixed minerology; therefore, they are considered taxadjuncts. Use and management, however, are similar.

Falba series

The Falba series consists of moderately deep, loamy soils that are somewhat poorly drained. These soils are on uplands. They formed in tuffaceous material. Slopes range from 1 to 5 percent.

Typical pedon of Falba fine sandy loam, 1 to 5 percent slopes; from the town of Burton, northwest to the intersection of Farm Road 2780 and Farm Road 1697 about 3 miles west on Farm Road 2780, 0.9 mile west and north on a county road, 0.6 mile west, and 300 feet north of road; in pasture.

A1—0 to 4 inches; light gray (10YR 7/2) fine sandy loam, light brownish gray (10YR 6/2) moist; massive; hard, friable; medium acid; abrupt wavy boundary.

B2tg—4 to 24 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak coarse subangular blocky structure; common thick clay films; strongly acid; clear wavy boundary.

Cr—24 to 45 inches; light gray (10YR 7/1) tuffaceous clay, light gray (10YR 7/1) moist; strongly acid.

The solum ranges from 20 to 40 inches in thickness. The boundary between the A and Bt horizons is abrupt. The Bt horizon cracks during dry seasons. The soil is saturated for short periods during wet seasons.

The A horizon is 4 to 10 inches thick. It is grayish brown, light gray, light brownish gray, or brown. Reaction is strongly acid through medium acid.

The Btg horizon is 12 to 34 inches thick. It is gray, dark gray, grayish brown, or dark grayish brown. The Btg has none to common, distinct, brownish or yellowish mottles. Texture is clay loam or clay, and clay content is 35 to 60 percent. Reaction is strongly acid to very strongly acid.

The Cr horizon consists of stratified, clayey tuff that contains volcanic materials, sandstone, or siltstone. It is weakly to strongly cemented. Reaction is neutral to strongly acid.

Frelsburg series

The Frelsburg series consists of deep, calcareous, clayey soils that are well drained. These soils are on uplands. They formed in weakly consolidated, calcareous sediments. Slopes range from 1 to 8 percent.

Typical pedon of Frelsburg clay, 1 to 3 percent slopes (fig. 18); from intersection of Texas Highway 105 and Farm Road 50 about 3 miles northeast of Brenham, 3.6 miles north on Farm Road 50, 0.8 mile west on paved county road, l.6 miles north on gravel road, 0.6 mile west, and 500 feet south-southeast of road, in rangeland; the site is midway between a microknoll and a microdepression.

A1—0 to 8 inches; dark gray (10YR 4/1) clay, dark gray (10YR 4/1) moist; common medium faint very dark gray (10YR 3/1) mottles; moderate medium angular blocky structure; extremely hard, very firm, sticky and plastic; many fine roots; common fine pores; granular mulch one-half inch thick on surface; calcareous; moderately alkaline; clear wavy boundary.

A12—8 to 55 inches, dark gray (10YR 4/1) clay, dark gray (10YR 4/1) moist; moderate medium angular blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; few fine pores; slickensides begin at 8 inches, are 3 to 6 feet across, and are tilted at 45 degrees from the horizontal; few vertical streaks of very dark gray (10YR 3/1) in old cracks; few fine pitted concretions of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

ACca—55 to 75 inches, light gray (10YR 7/2) clay, light gray (10YR 7/2) moist; weak medium angular blocky structure; extremely hard, very firm, sticky and plastic; many large slickensides; many soft masses and many medium concretions of calcium carbonate; few fine black concretions; calcareous; moderately alkaline.

Cycles of microdepressions and microknolls are repeated at 5 to 15 feet intervals. In native grass areas microknolls are 4 to 10 inches higher than microdepressions. The microrelief is an up-and-down-pattern in areas of more than 2 percent slope and is irregularly aligned on slopes of less than 2 percent.

When dry, the surface has a granular mulch 1/4 to 1/2 inch thick, and cracks of up to 3 inches wide at the surface extend to a depth of 45 inches. The combined A and AC horizons range from 60 inches to more than 100 inches in thickness. They are 45 to 60 percent clay throughout. Intersecting slickensides begin at a depth of about 8 to 12 inches below the surface. Slickensides

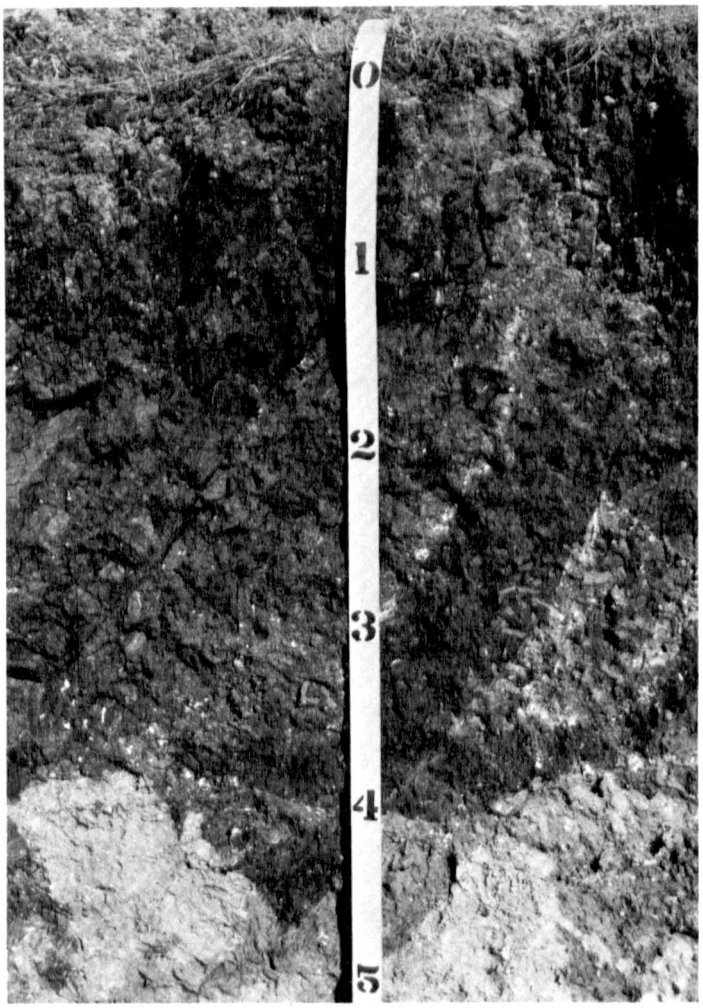


Figure 18.—Profile of Frelsburg clay, 1 to 3 percent slopes. This soil is darker in microdepressions and lighter colored in microknolls.

range up to several feet across and are tilted at 45 to 70 degrees from the horizontal. The slickensides with the steeper angles are near the microknolls. Reaction is mildly or moderately alkaline. Chroma is less than 1.5 to a depth of 22 to 70 inches in the microdepressions and to a depth of 60 inches in the microknolls.

The A horizon is black, very dark gray, dark gray, or gray. Vertical streaks, or mottles, of darker material are present in some pedons. Faint mottles of light gray and grayish brown range from none to common. The A horizons that have value of 5.5 or less (dry) and 3.5 or less (moist) range in thickness from 0 to 6 inches in the microknolls and from 40 to 60 inches in the microdepressions. The A horizon is less than 12 inches thick in more than 50 percent of the pedon.

The AC horizon is light gray, grayish brown, light brownish gray, and light olive gray. Mottles in shades of

gray, brown, and yellow range from none to common. Few to many concretions and many soft masses of calcium carbonate are present in the lower part of the AC horizon. Black concretions range from none to few.

The C horizon is at a depth of less than 80 inches in some pedons. It is light gray and light brownish gray and has common, coarse, prominent mottles of yellow and olive. It is clay, shaly clay, or marl.

Gowen series

The Gowen series consists of deep, loamy soils that are well drained. These soils are on bottom lands. They formed in loamy sediments. Slopes range from 0 to 1 percent.

Typical pedon of Gowen clay loam, frequently flooded; from intersection of Farm Road 2780 and Farm Road 1697 north of Burton, approximately 6.4 miles northwest on Farm Road 2780, 2.0 miles southwest on county road, north 1.0 mile, and 200 feet west of road; in a pasture.

A11—0 to 10 inches; very dark grayish brown (10YR 3/2) clay loam; very dark brown (10YR 2/2) moist; moderate medium granular and weak subangular blocky structure; hard, firm, sticky and plastic; common fine roots; common worm casts; neutral; gradual smooth boundary.

A12—10 to 24 inches; very dark gray (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; moderately alkaline; gradual smooth boundary.

B2—24 to 44 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; moderately alkaline; gradual smooth boundary.

C—44 to 60 inches; grayish brown (10YR 5/2) clay loam, thin strata of dark gray material throughout; massive; very hard, very firm, very sticky and plastic; moderately alkaline.

The solum is 40 to 60 inches thick and is clay loam throughout. The reaction ranges from neutral to moderately alkaline.

The A horizon is dark gray, dark grayish brown, very dark gray, or very dark grayish brown.

The B horizon is dark grayish brown, grayish brown, light brownish gray, or grayish brown. This horizon does not occur in some pedons.

The C horizon is grayish brown, brown, dark grayish brown, or very dark grayish brown. Texture is clay loam or sandy clay loam.

Greenvine series

The Greenvine series consists of moderately deep, clayey soils that are moderately well drained. These soils are on uplands. They formed in tuffaceous, clayey sediments. Slopes range from 1 to 5 percent.

Typical pedon of Greenvine clay, 1 to 3 percent slopes; from Brenham 9 miles north on Texas Highway 36, 3 miles east on Farm Road 390, 1.5 miles northwest on a county road, and 1 mile northeast; in pasture.

A11—0 to 6 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and plastic; many fine roots; neutral; gradual wavy boundary.

A12—6 to 18 inches; very dark gray (N 3/0) clay, black (N 2/0) moist; moderate medium angular blocky structure; extremely hard, very firm, very sticky and plastic; intersecting slickensides for wedge-shaped peds that have long axes tilted about 45 degrees from horizontal; common fine roots; moderately alkaline; calcareous; clear wavy boundary.

AC—18 to 31 inches; gray (10YR 6/1) clay, gray (10YR 5/1) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; common large intersecting slickensides; calcareous; moderately alkaline; clear smooth boundary.

Cr—31 inches; gray and grayish brown calcareous clayey sediments that grade to acid tuffaceous clay.

When dry, the surface has cracks which are 1 to 2 inches wide and which extend to a depth of 20 inches or more. The solum is 20 to 40 inches deep to paralithic contact. Texture is clay or silty clay. The solum has carbonates from 6 inches to the paralithic contact. The solum is neutral to moderately alkaline. Intersecting slickensides begin at a depth of about 15 inches.

The A horizon is more than 12 inches thick in 50 percent or more of the pedon. The A11 horizon is black, very dark gray, or dark gray. It is neutral or moderately alkaline and noncalcareous. The boundary is clear to gradual and wavy. The A12 horizon is very dark gray, black, dark gray, or gray. Slickensides that intersect range from few to common. The boundary with the AC horizon is clear to gradual and wavy.

The AC horizon is gray, dark gray, dark grayish brown, and light brownish gray. Slickensides that intersect are common. Some pedons contain concretions of calcium carbonate. The boundary is clear and smooth.

The Cr horizon is clayey tuff, shaly clay, or fine grained tuffaceous sandstone.

Kaufman series

The Kaufman series consists of deep, clayey soils that are somewhat poorly drained. These soils are on bottom lands. They formed in alkaline, clayey alluvium. Slopes range from 0 to 1 percent.

Typical pedon of Kaufman clay, frequently flooded; from the town of Burton, 6.2 miles north-northwest on Farm Road 1697, 0.7 mile north on blacktop road

(formerly Farm Road 1697, which crosses Cedar Creek), and 100 feet east, by old oak tree in open pasture; the site is 0.3 mile east of Cedar Creek.

A11—0 to 8 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium angular blocky structure; very hard, very firm, very sticky and very plastic; many fine roots; peds have shiny faces; noncalcareous; mildly alkaline; gradual wavy boundary.

A12—8 to 60 inches, dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium angular blocky structure; very hard, very firm, very sticky and very plastic; common intersecting slickensides; noncalcareous; mildly alkaline.

Undisturbed areas have a gilgai microrelief. The solum is clay or silty clay and more than 60 inches thick. The soil is medium acid to mildly alkaline, and some pedons are calcareous below a depth of 24 inches. The 10- to 40-inch control section is from 60 to 80 percent clay. Intersecting slickensides begin about 16 to 32 inches below the surface.

The A horizon is black or very dark gray. Reaction is medium acid to mildly alkaline.

Kiomatia series

The Kiomatia series consists of deep, sandy soils that are well drained. These soils are on flood plains near stream channels. They formed in moderately alkaline, sandy sediments. Slopes range from 0.5 to 5 percent.

Typical pedon of Kiomatia loamy fine sand in an area of Kiomatia and Norwood soils, frequently flooded; from the town of Washington, 5 miles southeast to the intersection of Farm Road 1370 and Farm Road 2726, 2 miles south on Farm Road 2726, 1.5 miles south on county road to church, 2.5 miles east and south, on field road.

A—0 to 4 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/4) moist; weak fine granular structure; very friable; calcareous; moderately alkaline; abrupt smooth boundary.

C—4 to 60 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 4/4) moist; single grained; loose; few shell fragments; thin darker lenses of silt loam; calcareous; moderately alkaline.

The soil is moderately alkaline and calcareous throughout. Bedding planes are present throughout.

The A horizon is light brown or brown loamy fine sand or fine sand and thin strata of fine sand, fine sandy loam, silt loam, and silty clay loam.

The C horizon is light brown or brown. Most pedons have thin strata of silt loam.

Klump series

The Klump series consists of deep, well drained soils. These soils are on uplands. They formed in loamy, calcareous material weathered from sandstone. Slopes range from 1 to 8 percent.

Typical pedon of Klump loamy sand, 5 to 8 percent slopes (fig. 19); from Brenham, 9 miles east on Texas Highway 105, 2.5 miles east on Farm Road 2193, 0.2 mile south on private road, and 200 feet east; in open pasture.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loamy sand; very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common worm casts; common fine roots; few fine pores; slightly acid; clear smooth boundary.

A12—5 to 13 inches; brown (7.5 4/2) loamy sand; dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common fine roots; common fine pores; common worm casts; slightly acid; clear smooth boundary.

B21t—13 to 17 inches; brown (7.5YR 4/2) sandy clay loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; hard, firm, slightly sticky

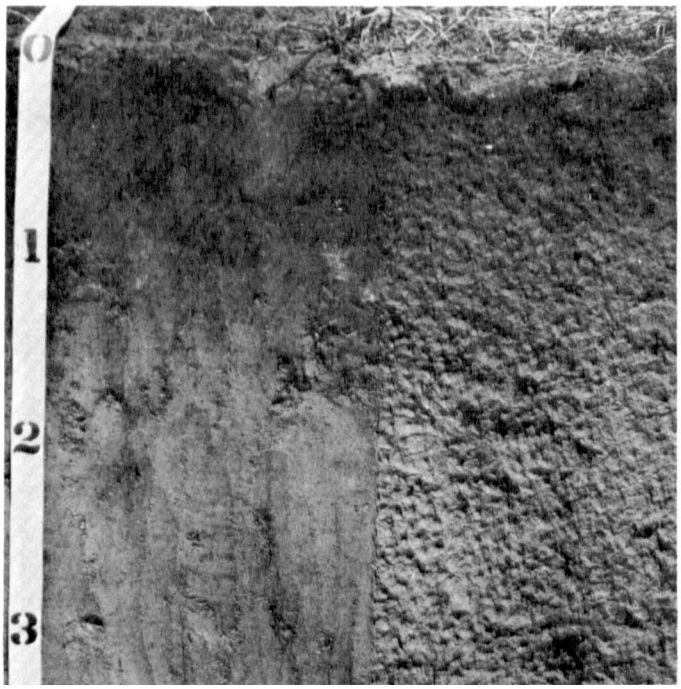


Figure 19.—Profile of Klump loamy sand, 5 to 8 percent slopes.

and slightly plastic; common fine roots; common fine pores; common thick clay films on faces of peds; common worm casts; vertical tubes of reddish material in worm casts; slightly acid; clear smooth boundary.

B22t—17 to 23 inches; dark red (2.5YR 3/6) sandy clay loam, dark red (2.5YR 3/6) moist; common dark brown (7.5YR 3/2) coatings on ped faces; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine roots; few fine pores; common clay films on ped faces; strongly acid; gradual smooth boundary.

B23t—23 to 31 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine roots; few fine and medium pores; common thick clay films on ped faces; few vertical tubes of dark brown worm casts; medium acid; gradual smooth boundary.

B3—31 to 56 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak coarse subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; few fine roots; few fine pores; thin patchy clay films on ped faces; medium acid; gradual smooth boundary.

C—56 to 64 inches; yellowish red (5YR 5/8) sandy loam, yellowish red (5YR 4/8) moist; massive; slightly hard, friable, slightly sticky and nonplastic; slightly acid.

The solum is 40 to 60 inches deep to sandier material.

The A horizon is 10 to 18 inches thick. It is very dark grayish brown, dark grayish brown, grayish brown, brown, or dark brown. Reaction ranges from medium acid to mildly alkaline.

The B2t horizon is coarsely mottled with dark brown, brown, yellowish red, reddish yellow, yellowish brown, or dark red. It contains common ped coatings of dark brown and brown. Texture is clay loam or sandy clay loam, and clay content is 18 to 35 percent. Reaction ranges from medium acid to neutral.

The B3 horizon is reddish yellow, yellowish red, or strong brown sandy loam or sandy clay loam. Reaction is medium acid or neutral. Some pedons do not have a B3 horizon.

The C horizon has colors of yellow, yellowish red, brownish yellow, and reddish yellow. Texture is sandy loam or sand. Reaction is medium acid to moderately alkaline. Some pedons are calcareous.

Knolle series

The Knolle series consists of deep, well drained soils on uplands. These soils formed in thick beds of sandy and loamy material weathered from sandstone. Slopes range from 2 to 8 percent.

Typical pedon of Knolle coarse sand, 2 to 8 percent slopes; from the intersection of Texas Highway 105 and Farm Road 2193, 3.5 miles northeast on Texas Highway 105, 1.0 mile south on county road, and 100 feet east of road; in open pasture.

Ap—0 to 8 inches; grayish brown (10YR 5/2) coarse sand, very dark grayish brown (10YR 3/2) moist; weak coarse blocky structure; soft, very friable, nonsticky and nonplastic; many fine roots; few krotovinas; slightly acid; clear smooth boundary.

B21t—8 to 12 inches; grayish brown (10YR 5/2) loamy coarse sand, very dark grayish brown (10YR 3/2) moist; weak coarse blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; common fine pores; thin patchy clay films; slightly acid; gradual smooth boundary.

B22t—12 to 26 inches; yellowish red (5YR 4/6) sandy clay loam, yellowish red (5YR 4/6) moist; common medium prominent dark brown (7.5YR 4/2) coatings on peds; weak medium subangular blocky structure; hard, friable, sticky and plastic; common fine roots; common fine pores; thick clay films on faces of peds; medium acid; gradual smooth boundary.

B23t—26 to 34 inches; yellowish red (5YR 4/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few roots; few fine pores; coatings on peds of dark brown (7.5YR 4/2); thick clay films on faces of peds; strongly acid; gradual smooth boundary.

B3—34 to 46 inches; yellowish red (5YR 5/8) sandy clay loam, yellowish red (5YR 4/6) moist, weak medium subangular blocky structure; slightly hard, friable, sticky and plastic; few patchy clay films on faces of peds; medium acid; gradual smooth boundary.

C—46 to 62 inches; strong brown (7.5YR 5/6) sandy loam, strong brown (7.5 5/6) moist; massive hard, friable; medium acid.

The solum ranges from 40 to 60 inches in thickness. Clay decreases from the maximum range by 20 percent at a depth of 40 to 60 inches. The argillic horizon has base saturation of 35 to 75 percent.

The Ap horizon is very dark grayish brown, grayish brown, dark brown, or brown. Reaction ranges from medium acid to neutral.

The B21t horizon is brown, grayish brown, or dark brown. Texture is typically sandy loam but can be loamy coarse sand and loamy sand. Reaction ranges from strongly acid to neutral.

The B22t and B23t horizons have matrix colors of brown, reddish brown, dark brown, yellowish red, and dark grayish brown. Common to many mottles are in these colors plus brown, dark brown, and dark grayish brown. Texture is sandy clay loam or clay loam that has clay content of from 20 to 35 percent. Reaction ranges from strongly acid to neutral.

The B3 horizon is yellowish brown, brownish yellow, yellowish red, or reddish yellow. Mottles range from none

to common in these colors. Some pedons have brownish yellow and yellowish brown mottles. Texture is sandy clay loam, loam, or sandy loam. Reaction ranges from strongly acid to slightly acid.

The C horizon is strong brown and reddish yellow sandy clay loam to loamy fine sand. Reaction ranges from strongly acid to slightly acid.

Koether series

The Koether series consists of shallow and very shallow soils that are somewhat excessively drained. These soils formed in cemented, coarse-grained, tuffaceous sandstone. Slopes range from 5 to 50 percent.

A typical pedon of Koether stony loamy sand in an area of Burlewash-Koether association, steep; from the town of Burton, 6 miles west on U. S. Highway 290 to Carmine, west on U. S. Highway 290 for 3.7 miles, across railroad track, 0.8 mile east, and 1.0 mile north on private road; site is 100 feet north of edge of a steep break.

A1—0 to 16 inches; light brownish gray (10YR 6/2) stony loamy sand, dark grayish brown (10YR 4/2) moist; single grained; loose, nonsticky and nonplastic; about 50 percent by volume fragments of sandstone greater than 3 inches in diameter; very strongly acid; abrupt wavy boundary.

R—16 inches; slightly fractured, strongly cemented, coarse-grained sandstone.

The solum is 7 to 20 inches deep to lithic contact. It is 35 to 70 percent angular sandstone fragments.

The A horizon is light brownish gray or pale brown stony loamy sand or cobbly loamy sand that is very strongly acid or strongly acid. It is from 30 to 70 percent, by volume, fragments of sandstone greater than 3 inches in diameter. It is from 2 to 15 percent, by volume, fragments of sandstone 2 mm to 3 inches in diameter.

The R horizon is strongly cemented, coarse-grained sandstone that is fractured at intervals of several feet.

Latium series

The Latium series consist of deep, calcareous, clayey soils that are well drained. These soils are on uplands. They formed in weakly consolidated, calcareous sediments. Slopes range from 3 to 12 percent.

Typical pedon of Latium clay, 5 to 8 percent slopes; from the intersection of U. S. Highway 290 and Farm Road 577 on the east side of Brenham, 3.0 miles east on U. S. Highway 290, 0.8 mile south on gravel road, and 300 feet west; in rangeland; site is midway between a microknoll and a microdepression.

A1—0 to 4 inches; dark grayish brown (2.5Y 4/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse granular structure; extremely hard, very firm, sticky and plastic; many fine roots; calcareous; moderately alkaline; clear wavy boundary.

AC1—4 to 33 inches; light olive brown (2.5Y 5/4) clay, light olive brown (2.5Y 5/4) moist; moderate medium angular blocky structure with common wedge-shaped aggregates; extremely hard, very firm, sticky and plastic; many fine roots; common fine pores, common soft masses and concretions of calcium carbonate; slickensides about 2 feet by 4 feet and tilted 45 degrees to horizontal; calcareous; moderately alkaline; gradual wavy boundary.

AC2—33 to 50 inches; light gray (2.5Y 7/2) clay, light gray (2.5Y 7/2) moist; moderate medium angular blocky structure; extremely hard, very firm, sticky and plastic; many fine roots; few fine pores; slickensides about 2 feet by 4 feet tilted 45 degrees from horizontal; common medium concretions of calcium carbonate; vertical streaks of darker material in old filled cracks; calcareous; moderately alkaline; gradual wavy boundary.

C—50 to 70 inches; light gray (2.5Y 7/2) clay, light gray (2.5Y 7/2) moist; many coarse prominent light brown (7.5YR 6/4) mottles; slickensides several feet wide tilted 45 degrees from horizontal; gray coatings 1/8 inch thick on faces of slickensides; common medium concretions of calcium carbonate; calcareous; moderately alkaline.

Untilled areas have gilgai microrelief. Microdepressions are 1 to 3 feet wide and 2 to 8 inches deep, and microknolls are 10 to 16 feet wide and are oriented up and down slope. The surface has 2-inch-wide cracks which extend to a depth of more than 20 inches and which remain open 90 to 150 cumulative days in most years.

The solum is clay or silty clay that is 40 inches to more than 60 inches thick. Clay content ranges from 45 to 60 percent. The solum is mildly alkaline or moderately alkaline and is calcareous throughout. Slickensides begin at a depth of about 8 inches and are present throughout the pedon. The boundaries between horizons is wavy or irregular.

The A or Ap horizon is dark grayish brown, very dark gray, dark gray, or very dark grayish brown. Mottles in shades of gray or brown range from none to common. Where the moist color value is less than 3.5, the horizon is less than 12 inches thick in more than 50 percent of the pedon. Few, fine concretions of calcium carbonate are commonly present.

The AC horizon is light olive brown, light gray, grayish brown, and pale brown. Some pedons are mottled with these colors. Darker material is along old crack channels. This horizon has slickensides which are tilted 45 to 75 degrees from the horizontal and which intersect. These slickensides are 2 to 8 feet wide. They are tilted at a higher degree near the microknolls. Soft

masses of calcium carbonate and medium and small concretions of calcium carbonate range from common to many.

The C horizon is light gray, light brownish gray, or pale brown. It is coarsely mottled in shades of brown, yellow, or gray. It is partly weathered marl or calcareous clay. Small and medium slickensides are common.

Lufkin series

The Lufkin series consists of deep, loamy soils that are somewhat poorly drained to poorly drained. These soils are on uplands and terraces. They formed in slightly acid to alkaline, clayey sediments. Slopes range from 0 to 1 percent.

Typical pedon of Lufkin fine sandy loam, 0 to 1 percent slopes; from Burton, approximately 3 miles east on U. S. Highway 290, 5.1 miles northwest on Farm Road 1948, 2.0 miles north and west on a hard-surfaced road, east 0.2 miles on county road, and 200 feet south; in a pasture.

Ap—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; few fine faint brown mottles; weak subangular blocky structure; hard, friable; strongly acid; abrupt wavy boundary.

B21tg—8 to 12 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; weak fine subangular blocky structure; very hard, very firm; slightly acid; clear smooth boundary.

B22tg—12 to 15 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; few fine faint dark yellowish brown mottles; weak fine subangular blocky structure; very hard, very firm; slightly acid; clear smooth boundary.

B23tg—15 to 35 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate medium blocky structure; very hard, extremely firm; few slickensides; neutral; clear smooth boundary.

B3g—35 to 48 inches; light gray (10YR 7/2) sandy clay, light brownish gray (10YR 6/2) moist; weak medium subangular blocky structure; very hard, extremely firm; very dark gray coatings on ped faces; few soft masses of calcium carbonate; few calcium sulfate crystals; moderately alkaline; clear smooth boundary.

Cg—48 to 80 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; massive; very hard, extremely firm; few calcium sulfate crystals; moderately alkaline.

The solum ranges from 40 to 60 inches in thickness. The soil cracks during dry periods. It is saturated for short periods during wet seasons.

The A1 horizon is very dark gray, dark gray, gray, dark brownish gray, grayish brown, or light brownish gray.

The A2 horizon is gray, light brownish gray, or white. In some pedons the A2 horizon has been incorporated into the A1 horizon by cultivation. The reaction is strongly acid to slightly acid. The boundary between the A and Btg horizons is abrupt wavy to smooth.

The Btg horizon is grayish brown or light brownish gray. Less than 20 percent of the volume of the Btg horizon is mottled with brown, olive, or yellow. The Btg horizon is clay, and clay content ranges from 40 to 50 percent. The reaction ranges from strongly acid to mildly alkaline; however, in some pedons the lower part of the Btg horizon has soft masses of calcium carbonate and is moderately alkaline.

The B3g horizon is light brownish gray, light gray, or white. Texture is clay, sandy clay, clay loam, or sandy clay loam. Reaction is moderately alkaline. Some pedons are calcareous. In some pedons gypsum crystals are present. In others there is no B3g horizon.

The Cg horizon ranges from brownish gray to white. Texture of the Cg horizon is sandy clay loam, clay, or fine sandy loam that is moderately alkaline. This horizon may or may not be calcareous.

Mabank series

The Mabank series consists of deep, loamy soils that are somewhat poorly drained. These soils are on terraces and uplands. They formed in alkaline marine clays. Slopes range from 0 to 3 percent.

Typical pedon of Mabank fine sandy loam, 0 to 1 percent slopes; from the town of Burton, 3.5 miles northwest on Farm Road 2780, about 3.0 miles northwest on a county road, and 900 feet north on private road.

A1—0 to 8 inches; gray (10YR 6/1) fine sandy loam, dark gray (10YR 4/1) moist; massive; very hard, friable; common fine roots; thin discontinuous A2g horizon of light gray (10YR 7/1) in lower part; medium acid; abrupt wavy boundary.

B21tg—8 to 36 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak medium angular blocky structure; extremely hard, very firm; common prominent clay films; medium acid; gradual wavy boundary.

B22tg—36 to 48 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; few fine faint yellowish brown mottles; weak medium angular blocky structure; extremely hard, very firm; common prominent clay films; neutral; gradual wavy boundary.

B3g—48 to 62 inches; gray (10YR 5/1) clay, gray (10YR 5/1) moist; weak coarse angular blocky structure; extremely hard, very firm; few clay films; neutral.

The solum ranges from 60 inches to more than 80 inches in thickness. Depth to carbonates is 20 to 55 inches. The soil cracks to the surface during dry seasons. This soil is saturated during the winter and spring months of most years.

The A horizon is very dark gray, dark gray, gray, light gray, dark grayish brown, grayish brown, or light

brownish gray. It is massive and hard or very hard when dry. It is medium acid to neutral. The boundary between the A and Btg horizon is abrupt and wavy. Some pedons have a thin, discontinuous A2g horizon.

The B21tg horizon is very dark gray or dark gray clay or clay loam. It is medium acid to mildly alkaline. The lower part of the B2tg horizon is dark gray or gray. It has few, fine to medium mottles of brown, yellowish brown, gray, or reddish brown in some pedons. Reaction ranges from neutral to moderately alkaline.

The B3g horizon is gray or light gray and has mottles of olive, yellow, or olive brown.

Nahatche series

The Nahatche series consists of deep, loamy soils that are somewhat poorly drained. These soils are on flood plains. They formed in alluvium washed from claypan soils. Slopes are less than 1 percent.

Typical pedon of Nahatche clay loam, frequently flooded; from the intersection of U. S. Highway 36 and Farm Road 1948 near Lake Somerville, 7.3 miles west on Farm Road 1948, 0.1 mile north on a county road, and 200 feet east: in idle land.

A1—0 to 8 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium angular blocky structure; hard, friable; mildly alkaline; abrupt boundary.

C1g—8 to 21 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; common medium faint pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; common thin strata of fine sandy loam and loamy fine sand; neutral; clear boundary.

C2g—21 to 24 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, very firm; neutral; abrupt boundary.

C3g—24 to 60 inches; gray (10YR 6/1) sandy clay loam, gray (10YR 5/1) moist; weak medium angular blocky structure; hard, friable; neutral; abrupt boundary.

The A horizon is dark brown, brown, grayish brown, or dark grayish brown.

The C1g horizon is grayish brown or dark grayish brown. The C2g and C3g horizons are light gray, gray, dark gray, dark grayish brown, or light brownish gray Mottles throughout the Cg horizon are in shades of brown or yellow. The reaction ranges from mildly alkaline to slightly acid. In some pedons buried horizons are present below a depth of 40 inches.

Norwood series

The Norwood series consists of deep, loamy soils that are well drained. These soils are on bottom lands. They formed in alkaline alluvium. Slopes range from 0 to 1 percent.

Typical pedon of Norwood silt loam, 0 to 1 percent slopes (fig. 20); 8.0 miles south of Washington to Brown College community and 2 miles east; in a pasture.

Ap—0 to 8 inches; reddish brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; clear smooth boundary.

C—8 to 60 inches; light reddish brown (5YR 6/4) silt loam, light reddish brown (5YR 6/4) moist; strata of darker and finer material; bedding planes evident; calcareous; moderately alkaline.

The soil is calcareous throughout. Strata of various textures and colors are below a depth of about 8 inches.

The A horizon is reddish brown, brown, or yellowish red.

The C horizon is light reddish brown, brown, or strong brown. Texture ranges from very fine sandy loam to silty clay loam. This horizon has thin strata of loamy sand and clay loam.

Oklared series

The Oklared series consists of deep, loamy soils that are well drained. These soils formed in alluvium of the Brazos River. They formed in calcareous sediments derived mostly from the Permian red beds. Slopes range from 0 to 1 percent.

Typical pedon of Oklared very fine sandy loam, 0 to 1 percent slopes; from intersection of Farm Road 1370 and Farm Road 2726 which is about 5 miles south of the town of Washington, about 2 miles south on Farm Road 1370 to end of pavement, and 1.0 mile east; in cropland.

Ap—0 to 8 inches; reddish brown (5YR 5/3) very fine sandy loam, reddish brown (5YR 4/3) moist; structureless; friable, loose; common fine roots; calcareous; moderately alkaline; abrupt smooth boundary.

C—8 to 60 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; thin strata of silt loam and fine sand; evident bedding planes; friable, loose; common fine roots; calcareous, moderately alkaline.

The soil is calcareous throughout. Some pedons contain dark buried horizons.

The Ap horizon is reddish brown or brown.

The C horizon is light reddish brown or reddish brown. Texture is fine sandy loam, very fine sandy loam, or loam. There are thin strata of coarser or finer material. The 10- to 40-inch control section averages 12 to 18 percent clay and is 15 percent or more fine sand or coarser material.

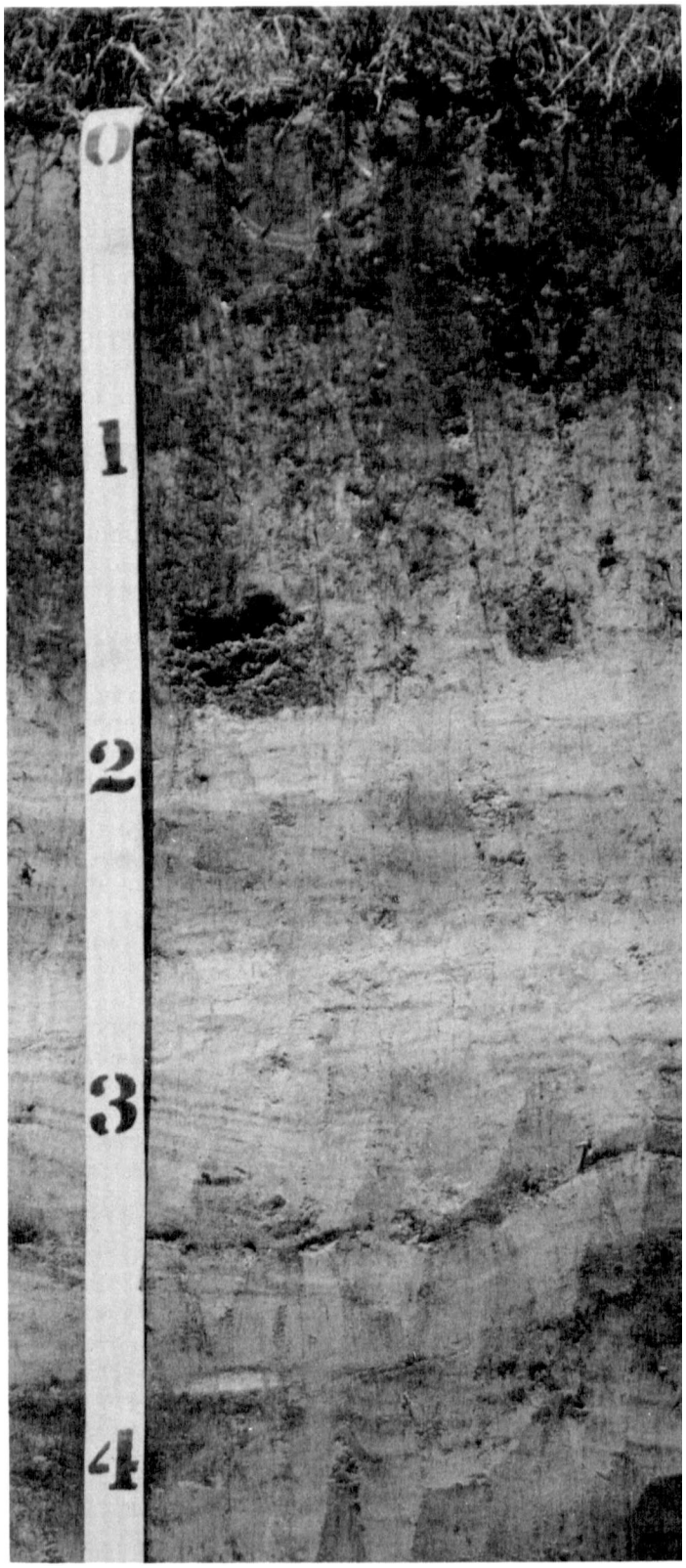


Figure 20.—Profile of stratified Norwood silt loam, 0 to 1 percent slopes.

Padina series

The Padina series consists of deep, sandy soils that are moderately well drained. These soils are on high stream terraces and uplands. They formed in thick, sandy beds. Slopes range from 1 to 5 percent.

Typical pedon of Padina loamy fine sand, 1 to 5 percent slopes; from Brenham, 15 miles northeast on Texas Highway 105, 0.3 mile west on county road, 0.9 mile north to intersection with another county road, and 100 feet south of intersection; in pasture.

A1—0 to 25 inches; yellowish brown (10YR 5/4) loamy fine sand, dark yellowish brown (10YR 4/4) moist; single grained; loose; many fine roots; neutral; diffuse boundary.

A2—25 to 60 inches; light yellowish brown (10YR 6/4) loamy fine sand, yellowish brown (10YR 5/4) moist; single grained; loose; few black concretions in the lower part; slightly acid; clear wavy boundary.

B2t—60 to 80 inches; mottled reddish yellow (5YR 6/8) and white (10YR 8/2) sandy clay loam; moderate fine to medium subangular blocky structure; hard, firm; medium acid; thin patchy clay films; abrupt smooth boundary.

The solum ranges from 65 inches to more than 100 inches in thickness.

The A horizon is from 40 to 65 inches thick. It is neutral to medium acid. The A1 horizon is dark grayish brown, dark brown, brown, pale brown, dark yellowish brown, yellowish brown, very pale brown, grayish brown, or light brownish gray. The A2 horizon is light yellowish brown, pale brown, very pale brown, or brown. The boundary between the A2 and B2t horizons is wavy and irregular.

The B21t horizon is light gray, reddish yellow, or brownish yellow and has varying sizes and amounts of red, yellow, and gray mottles. Texture is sandy clay loam that is 18 to 35 percent clay. Reaction ranges from slightly acid to strongly acid.

Where the B22t horizon is at a depth of less than 80 inches, it is brownish yellow or light gray and has yellow, red, and gray mottles. Texture is sandy clay loam to sandy loam. Reaction is slightly acid to strongly acid.

Rehburg series

The Rehburg series consists of deep, somewhat poorly drained soils on uplands. These soils formed in stratified, compact, tuffaceous clay, sandy clay loam, and sandstone. Slopes are 1 to 5 percent.

A typical pedon of Rehburg loamy fine sand, 1 to 5 percent slopes; from the town of Burton, 5.0 miles northwest on Farm Road 1697 to its intersection with a county road, 0.5 mile northwest on county road, 350 feet west; in a wooded pasture.

A1—0 to 12 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; single grained; loose, very friable; many fine and few medium roots; medium acid; clear smooth boundary.
A2—12 to 23 inches; white (10YR 8/2) loamy fine sand, light brownish gray (10YR 6/2) moist; single grained; loose, very friable; many fine and few medium roots; medium acid; abrupt wavy boundary.
B21t—23 to 36 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; common medium prominent yellowish brown (10YR 5/8) and red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; clay films on faces of peds; strongly acid; clear wavy boundary.
B22t—36 to 44 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; few fine prominent brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; clay films on faces of peds; strongly acid; clear wavy boundary.
C4—44 to 60 inches; weakly to strongly cemented sandstone and tuffaceous clays; mottles of gray (2.5Y 6/2), pale olive (5Y 6/3), olive yellow (2.5Y 6/8), and yellowish brown (10YR 5/8); massive; very hard, very firm; few fine roots and organic stains in crevices; strongly acid.

The solum is 40 to 60 inches deep to paralithic contact. The A horizon ranges from strongly acid to neutral and the Bt horizon is very strongly acid to slightly acid.

The A horizon is 20 to 36 inches thick. It is light gray, very pale brown, white, or gray.

The B2t horizon is light brownish gray or grayish brown and has mottles of brown, yellow, and red. It is clay or sandy clay in the upper part. The lower part commonly contains less clay than the upper part. The clay content of the B2t horizon ranges from 35 to 60 percent. The clay content of the control section ranges from 25 to 35 percent.

The Cr horizon ranges from weakly to strongly cemented sandstone to compact, tuffaceous clays that are massive. Organic stains are commonly present in cracks and fractures.

Renish series

The Renish series consists of shallow and very shallow, well drained soils on uplands. These soils formed in beds of strongly cemented, calcareous sandstone. Slopes are 1 to 12 percent.

A typical pedon of Renish clay loam, 1 to 5 percent slopes (fig. 21): from the town of Burton, 0.6 mile east on U. S. Highway 290, 1.0 mile north on a county road, and 100 feet east; in pasture.

A1—0 to 12 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; very friable; many fine roots; common fine pores; calcareous; moderately alkaline; abrupt wavy boundary.
R—12 inches; indurated, calcareous sandstone that is coarsely fractured.

The solum ranges from 7 to 20 inches in thickness. The calcium carbonate equivalent ranges from 10 to 35 percent. The amount of calcareous sandstone fragments on the surface and in the A horizon ranges from 0 to 30 percent. The fragments are irregularly shaped and are 1/2 to 1 inch thick and about 2 to 6 inches across.

The A horizon is dark brown, brown, dark grayish brown, or very dark grayish brown.

A thin AC horizon or A&R horizon is in some pedons that have a solum 12 to 20 inches thick.

The bedrock consists of whitish or brownish, calcareous, indurated sandstone that has a hardness of greater than 3 on Mohs' scale. It is coarsely fractured and contains thin, horizontal layers of softer materials.

Shalba series

The Shalba series consists of shallow and very shallow, somewhat poorly drained soils on uplands. These soils formed in weakly cemented, tuffaceous sandstone that is fine grained. Slopes are 1 to 8 percent.

A typical pedon of Shalba fine sandy loam, 1 to 5 percent slopes (fig. 22); from the intersection of Texas Highway 36 and Farm Road 1948 near Lake Sommerville, 0.1 mile west on Farm Road 1948, 0.6 mile north on Overlook Park Road, 0.9 mile west on paved and gravel road to ridgetop; site is 50 feet north of road in idle land.

A1—0 to 4 inches; light gray (10YR 7/2) fine sandy loam, grayish brown (10YR 5/2) moist; massive; hard, friable; many fine roots; common fine and medium pores; very strongly acid; abrupt wavy boundary.
B2t—4 to 18 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; few fine distinct yellowish brown (10YR 5/4) mottles; weak medium angular blocky structure; very hard, very firm, very sticky and very plastic; common clay films; patchy dark coatings on faces of peds; few worm casts; few fine roots; few fine and medium pores; very strongly acid; clear wavy boundary.
Cr—18 to 40 inches; light gray (10YR 7/2) weakly cemented tuffaceous sandstone; few fine roots along fractures; strongly acid.

The solum is 7 to 20 inches deep to paralithic contact.

The A horizon is light gray, grayish brown, gray, or light gray. The reaction ranges from medium acid to very strongly acid. The boundary between the A and Bt horizons is abrupt and wavy.

Figure 21.—Profile of Renish clay loam, 1 to 5 percent slopes, strongly cemented sandstone is at a depth of 12 inches.

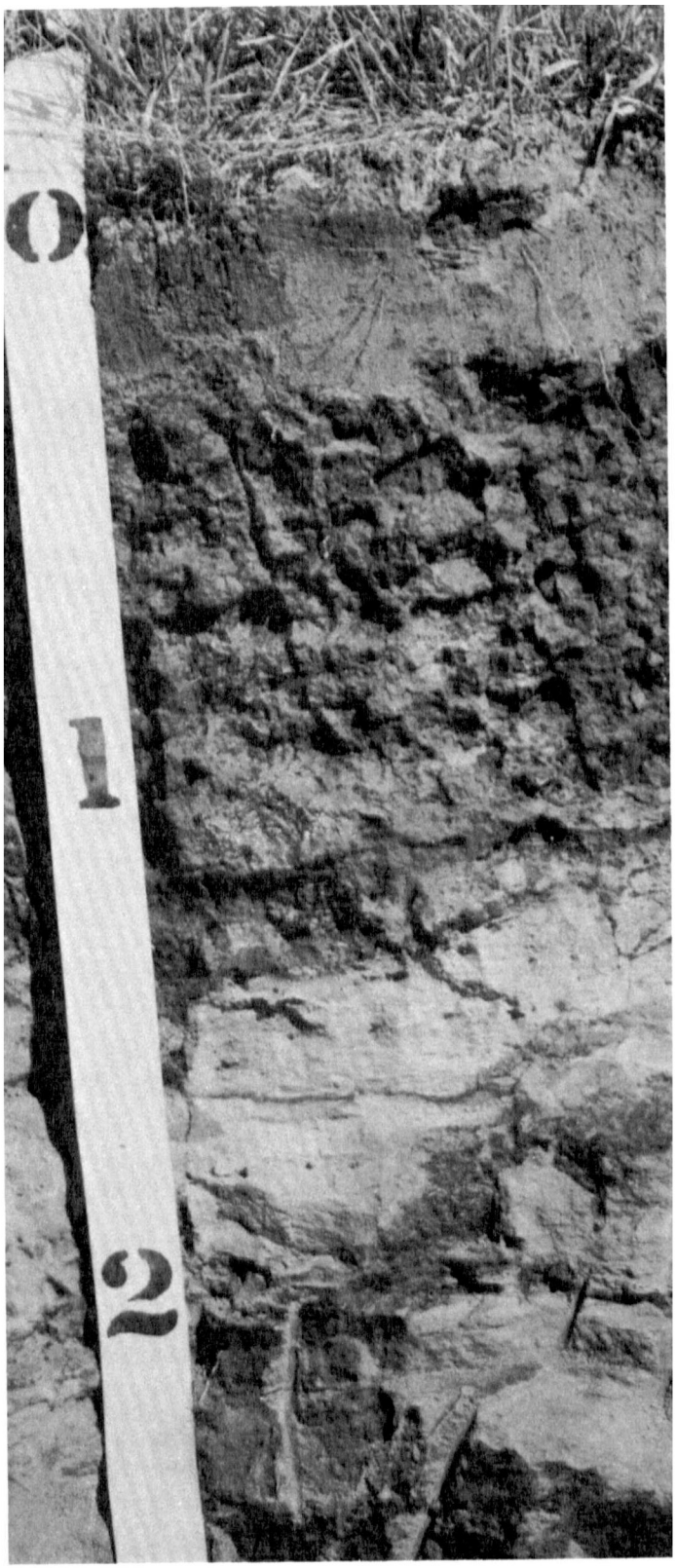


Figure 22.—Profile of Shalba fine sandy loam, 1 to 5 percent slopes. Weakly cemented, tuffaceous sandstone is at a depth of 18 inches.

The B2t horizon is grayish brown, dark grayish brown, brown, very dark gray, dark gray, or very dark grayish brown. Ped coatings are very dark gray, dark gray, and very dark grayish brown and range from few to common. Mottles are in ped interiors. The reaction ranges from medium to very strongly acid. The lower boundary of the Bt horizon is wavy to irregular.

The Cr horizon is clayey tuff, tuffaceous sandstone, siltstone, or tuffaceous clay. When crushed, texture is sandy loam or clay loam.

Silawa series

The Silawa series consists of deep, loamy soils that are well drained. These soils are on high stream terraces and uplands. They formed in sandy and loamy sediments. Slopes range from 1 to 8 percent.

Typical pedon of Silawa loamy fine sand, 1 to 5 percent slopes; from the town of Chappell Hill, north 3.0 miles on Farm Road 1155, 1.8 miles west and north on county road, and 2,800 feet northwest of road; in wooded pasture.

A1—0 to 3 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; structureless; loose, nonsticky and nonplastic; common roots and pores; slightly acid; clear smooth boundary.

A2—3 to 11 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; structureless; loose, nonsticky and nonplastic; common roots and pores; neutral reaction; clear abrupt boundary.

B21t—11 to 15 inches; yellowish red (5YR 5/8) sandy clay loam; fine prominent brownish yellow mottles; weak fine subangular blocky structure; very hard, very firm, sticky and plastic; common clay films; few roots; few siliceous pebbles; strongly acid; gradual smooth boundary.

B22t—15 to 29 inches; yellowish red (5YR 8/8) sandy clay loam, moist and dry; weak fine subangular blocky structure; hard, friable, sticky and plastic; common clay films; few roots; a few siliceous pebbles; strongly acid; gradual wavy boundary.

B3—29 to 45 inches; reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; weak medium blocky structure; soft, very friable, slightly sticky and slightly plastic; few clay films; strongly acid; gradual wavy boundary.

C—45 to 60 inches; reddish yellow (7.5YR 7/8) loamy fine sand, moist and dry; single grained; loose, nonsticky and nonplastic; few thin strata of reddish yellow sandy clay loam; sand grains are coarse; strongly acid.

The solum ranges from 40 to 60 inches in thickness. The clay content decreases from the maximum by more than 20 percent within 60 inches. Reaction is medium to strongly acid throughout the B2t horizon.

The A horizon is grayish brown, light brownish gray, very pale brown, brown, or dark grayish brown.

The B2t horizon is yellowish red, reddish brown, or red. It has few to common, prominent and distinct mottles in shades of brown and yellow. Texture is clay loam or sandy clay loam. Clay films are weak to moderately expressed.

The B3 horizon is strong brown, reddish yellow, or yellowish red. Texture is sandy clay loam or fine sandy loam. Clay films are weakly expressed.

The C horizon is reddish yellow, strong brown, yellowish red, yellow, brownish yellow, or very pale brown. Texture is loamy fine sand, fine sand, or sand.

Sumpf series

The Sumpf series consists of deep, very poorly drained soils that formed in thick, clayey sediments in old river channels of major streams that drain red beds. Slope is dominantly less than 1 percent.

A typical pedon of Sumpf clay, frequently flooded; from the town of Chappell Hill, 5.8 miles east-northeast on Farm Road 2447, and 0.6 mile east on private road; site is in old river channel in a pasture.

A11—0 to 28 inches; dark brown (7.5YR 3/2) clay, dark brown (7.5YR 4/2) moist; common medium faint very dark grayish brown (10YR 3/2) mottles; moderate coarse blocky structure; very hard, very firm, very sticky and very plastic; common fine roots; common stains in root channels; few thin horizontal strata; few medium slickensides; calcareous; moderately alkaline; gradual boundary.

A12—28 to 60 inches; dark brown (7.5YR 3/2) clay, dark brown (7.5YR 4/2) moist; common medium prominent yellowish red (5YR 4/6) mottles; weak coarse blocky structure; very hard, very firm, very sticky and very plastic; common fine roots; prominent coarse intersecting slickensides; calcareous; moderately alkaline.

IIC—60 to 75 inches; reddish brown (5YR 5/4) clay; reddish brown (5YR 4/4) moist; massive; very hard, very fine, very sticky and very plastic; few fine roots; few thin horizontal strata of coarser material; calcareous; moderately alkaline.

The solum ranges from 40 inches to more than 60 inches in thickness. Some pedons are noncalcareous in the upper 10 inches. Clay content of the 10- to 40-inch control section ranges from 60 to 80 percent. Intersecting slickensides range from few to common. Buried horizons of various colors and textures are common below a depth of 50 inches but are not diagnostic.

The A horizon is dark brown, dark reddish brown, or brown and has few to common mottles. It is 24 to 40 inches or more thick.

An AC horizon is present in some pedons. Where present, it is dark brown, brown, or dark grayish brown.

Mottles range from none to common. In some pedons the AC horizon is banded, or stratified, with varying loamy textures.

A IIC horizon commonly is between depths of 40 and 80 inches. It is reddish brown or yellowish red. Texture is most commonly clay but ranges to fine sandy loam.

Tabor series

The Tabor series consists of deep, loamy soils that are moderately well drained. These soils are on uplands. They formed in acid to alkaline clay and sandy clay. Slopes range from 1 to 5 percent.

Typical pedon of Tabor fine sandy loam, 1 to 5 percent slopes; from the bridge over the Brazos River about 2 miles north of the town of Washington, 0.5 mile southwest on Texas Highway 105, 800 feet west on a private road, and 60 feet south; in a pasture.

Ap—0 to 13 inches; light gray (10YR 7/2) fine sandy loam, light brownish gray (10YR 6/2) moist; common fine distinct brown (10YR 4/3) mottles; weak fine granular structure; hard, friable; moderately alkaline (area limed); abrupt wavy boundary.

B21t—13 to 23 inches; mottled grayish brown (10YR 5/2), yellowish red (5YR 4/6), and brownish yellow (10YR 6/6) clay; moderate medium subangular blocky structure; hard, firm; common prominent clay films; medium acid; gradual wavy boundary.

B22t—23 to 33 inches; mottled light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) clay; weak coarse subangular blocky structure; very hard, very firm; common prominent clay films; medium acid; clear wavy boundary.

B23t—33 to 52 inches; light yellowish brown (10YR 6/4) clay, yellowish brown (10YR 5/4) moist, few fine faint brown mottles; weak coarse subangular blocky structure; very hard, very firm; few patchy clay films; noncalcareous; moderately alkaline; gradual wavy boundary.

C—52 to 80 inches; mottled light gray (10YR 7/2), light yellowish brown (10YR 6/4), and yellowish red (5YR 5/6) clay; massive; extremely hard, extremely firm; few calcium sulfate crystals; few fine siliceous pebbles; noncalcareous; moderately alkaline.

The solum ranges from 40 to 70 inches in thickness. Less than 40 percent of the soil color above a depth of 30 inches is mottled with chroma of 2 or less.

The A horizon is very pale brown, light gray, pale brown, light brownish gray, brown, grayish brown, or dark grayish brown. Some pedons have an A2 horizon that has value and chroma 1 or 2 units higher than those of the A1 horizon. The A horizon is fine sandy loam or very gravelly fine sandy loam. In some pedons it contains as much as 75 percent, by volume, siliceous pebbles. It ranges from strongly acid to slightly acid except where it is limed.

The B2t horizon is pale brown, light yellowish brown, yellowish brown, or brownish yellow. It has few to many mottles of dark gray, gray, light gray, grayish brown, brown, yellowish red, reddish yellow, red, yellow, and olive. Clay content of the B2t horizon is 40 to 50 percent. Reaction is very strongly acid to medium acid.

In some pedons a B3 horizon is present. White crystals and calcium carbonate concretions are common in this horizon. Reaction is strongly acid to mildly alkaline.

The C horizon is clay, sandy clay, sandy clay loam, or clay loam and some have strata of sand. White crystals of calcium carbonate may be present.

Tremona series

The Tremona series consists of deep, sandy soils that are somewhat poorly drained. These soils are on uplands. They formed in interbedded clayey and loamy deposits. Slopes range from 1 to 8 percent.

Typical pedon of Tremona loamy fine sand, 1 to 5 percent slopes; from Burton, approximately 3 miles east on U.S. Highway 290, 5.1 miles northwest on Farm Road 1948, 3.7 miles west and north on a hard-surfaced county road, 0.6 mile east on a private road, and 200 feet north; in a pasture.

A—10 to 17 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; single grained; loose, very friable; medium acid; clear smooth boundary.

A21—17 to 25 inches; very pale brown (10YR 7/4) loamy fine sand, light yellowish brown (10YR 6/4) moist; single grained; loose, very friable; strongly acid, clear smooth boundary.

A22—25 to 28 inches; very pale brown (10YR 7/4) loamy fine sand, light yellowish brown (10YR 6/4) moist; single grained; loose, very friable; strongly acid; clear smooth boundary.

B21t—28 to 31 inches; mottled light gray (10YR 7/2) and brownish yellow (10YR 6/6) sandy clay loam; moderate fine subangular blocky structure; hard, friable; common patchy clay films; strongly acid, clear smooth boundary.

B22t—31 to 48 inches; light gray (10YR 7/2) clay; many medium prominent red (2.5YR 4/6) and common fine distinct strong brown mottles; moderate medium prismatic structure parting to moderate fine and medium blocky; very hard, very firm; thick clay films on vertical and horizontal ped faces; strongly acid; gradual smooth boundary.

B23t—48 to 63 inches; mottled very pale brown (10YR 7/3), red (2.5YR 5/6), and reddish yellow (7.5YR 6/6) sandy clay loam; coarse medium prismatic structure parting to weak medium blocky; hard, firm; clay films on vertical and horizontal ped faces; very strongly acid; gradual smooth boundary.

B3—63 to 84 inches; light red (2.5YR 6/8) sandy clay loam, red (2.5YR 5/8) moist; weak coarse prismatic

structure parting to weak blocky; slightly hard, friable; patchy clay films on horizontal ped faces, vertical faces coated with clean sand grains; very strongly acid, clear smooth boundary.
C—84 to 96 inches; yellow (10YR 7/6) fine sand, brownish yellow (10YR 6/6) moist; single grained; loose; very friable; very strongly acid.

The solum ranges from 60 inches to more than 80 inches in thickness.

The A1 horizon is very pale brown, pale brown, or brown loamy fine sand. Reaction ranges from medium acid to very strongly acid. The A2 horizon is very pale brown or pale brown. The reaction ranges from slightly acid to neutral.

The B2t horizon is mottled in colors of light gray, light brownish gray, pale brown, very pale brown, strong brown, reddish yellow, brownish yellow, and red. Texture is clay, sandy clay, or sandy clay loam. The reaction is strongly acid to mildly alkaline. Some pedons have a thin transition horizon from the A horizon to the Bt horizon (B1 horizon).

The B3 horizon is mottled in colors of dark red, red, reddish yellow, yellowish red, light gray, and brownish yellow. It is sandy clay loam or sandy clay. Reaction ranges from very strongly acid to mildly alkaline.

The C horizon is stratified with colors of yellow to brownish yellow to reddish yellow. The texture is mainly sandy clay or clay loam but ranges to fine sand in some pedons. Reaction is strongly acid to mildly alkaline.

Trinity series

The Trinity series consists of deep, clayey soils that are somewhat poorly drained. These soils are on bottom lands. They formed in calcareous, clayey alluvium. Slopes range from 0 to 1 percent.

Typical pedon of Trinity clay, frequently flooded; from the town of Chappell Hill, 5.5 miles north on Farm Road 1155, and 100 feet east on flood plain of New Year Creek in a pasture; the site is 0.2 mile south of creek channel.

A11—0 to 8 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; strong medium subangular blocky structure; very hard, firm, very sticky and very plastic; common fine roots; common medium worm casts; calcareous; moderately alkaline; diffuse boundary.
A12—8 to 19 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; few medium intersecting slickensides; calcareous; moderately alkaline; diffuse boundary.
A13—19 to 39 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic, common large intersecting slickensides that increase with depth; calcareous; moderately alkaline; diffuse boundary.
A14—39 to 64 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine angular blocky structure; very hard, very sticky and very plastic; common large intersecting slickensides; common fine concretions of calcium carbonate; calcareous; moderately alkaline; diffuse boundary.
A15—64 to 80 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine angular blocky structure; very hard, firm, very sticky and very plastic; few medium intersecting slickensides; few soft calcium carbonate masses; few fine pitted concretions of calcium carbonate; calcareous; moderately alkaline.

Cracks at the surface are 1 to 10 centimeters wide when the soil is dry. The solum ranges from 60 inches to more than 75 inches in thickness. It is calcareous and moderately alkaline throughout. Common medium to large intersecting slickensides are throughout most of the pedon. The solum is clay throughout. Clay content is more than 60 percent in the 10- to 40-inch control section.

The A horizon is black, very dark gray, dark gray, or gray. Few fine mottles of very dark grayish brown and dark brown colors are in some pedons. Soft masses of calcium carbonate and calcium carbonate concretions are present in the lower horizons of most pedons.

Wilson series

The Wilson series consists of deep, loamy soils that are somewhat poorly drained. These soils are on ancient terraces and uplands. They formed in alkaline, clayey alluvium or marine clays. Slopes range from 0 to 3 percent.

Typical pedon of Wilson clay loam, 1 to 3 percent slopes; from Brenham 3.0 miles northeast on Texas Highway 105, 5.1 miles north on Farm Road 50, and 300 feet west; in pasture.

Ap—0 to 4 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; massive when dry; very hard, firm; slightly acid; clear wavy boundary.
B21tg—4 to 25 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; common fine distinct yellowish red (5YR 4/6) mottles; moderate medium subangular blocky; extremely hard, very firm; slightly acid; gradual wavy boundary.
B22tg—25 to 41 inches; light gray (10YR 6/1) clay, gray (10YR 5/1) moist; common fine distinct yellowish red (5YR 5/8) mottles; moderate medium subangular blocky; extremely hard, very firm; neutral; gradual wavy boundary.
B23tg—41 to 52 inches; light gray (10YR 7/1) clay, gray (10YR 6/1) moist; moderate medium subangular

blocky structure; extremely hard, very firm; many fine and medium concretions of calcium carbonate; moderately alkaline; gradual wavy boundary.

B3g—52 to 60 inches; white (2.5Y 8/2) silty clay loam, light gray (2.5Y 7/2) moist; moderate medium subangular blocky structure; extremely hard, very firm; moderately alkaline.

The solum ranges from 40 inches to more than 60 inches in thickness. Cracks at the surface are 0.4 to 0.8 inch or more wide and extend to more than 24 inches in depth during dry periods.

The A horizon is black, very dark gray, dark gray, or very dark grayish brown. It is massive and hard when dry. Reaction ranges from medium acid to neutral.

The B21tg horizon is very dark gray, dark gray, or black. Some pedons contain few to common, fine and medium mottles that are brownish, reddish, or yellowish. The B21tg horizon is clay or silty clay and is 40 to 50 percent clay. Ferro-manganese concretions are present in some pedons. Reaction ranges from medium acid to moderately alkaline.

The B22tg and B23tg horizons are dark gray, gray, light gray, or grayish brown. Some pedons contain mottles of olive, brown, yellow, or red. Texture is clay or silty clay. Concretions of calcium carbonate do not occur in some pedons. Reaction ranges from neutral to moderately alkaline.

The B3g horizon is light gray, white, or pale olive silty clay loam. Concretions of carbonate are not in some of these horizons. Reaction is moderately alkaline.

The C horizon is 80 inches in some pedons. It is brownish gray, grayish brown, yellowish brown, pale brown, olive gray, olive brown, reddish yellow, or yellowish red. Texture is silty clay, clay, or silty clay loam.

formation of the soils

This section describes the factors of soil formation and relates them to the formation of soils in Washington County. It also explains the process of horizon development.

factors of soil formation

Soil is the product of the interaction of five major factors of soil formation: climate, living organisms, parent material, topography, and time. If one factor, such as climate or vegetation, varies a different kind of soil forms.

climate

The humid climate of Washington County, presumed to be similar to the climate existing as the soils formed, has promoted moderately rapid soil formation. The climate is uniform throughout the county, but its effect is modified locally by runoff. Differences among soils in Washington County are not believed to result from differences in climate.

living organisms

Plants, insects, animals, bacteria, and fungi are important in the formation of soils. Gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in soil structure and porosity are some of the changes caused by living organisms.

Vegetation probably has affected soil formation in Washington County more than other kinds of living organisms have. Soils under timber vegetation generally are low in organic matter. Some of the upland prairie soils are medium to high in organic matter.

parent material

Parent material is the unconsolidated mass from which soil is formed. It determines the limits of the chemical and mineral composition of the soil. In Washington County soils have formed in parent materials of two geologic systems: The Tertiary and the Quaternary.

Parent materials of the Tertiary System are mainly sandstone, sand, and clay beds of the Manning, Whitsett, Catahoula, Oakville, Sandstone, and Flemming Formations (*6*). The oldest stratigraphic unit, the Manning Formation, is exposed in northwestern Washington County. Parent materials of younger formations are exposed in sequence toward the south and east.

Soils formed in the Manning Formation are of the Burlewash, Koether, and Shalba series. Soils of the Whitsett and Catahoula Formations are of the Falba, Arol, and Rehburg series. Cargbengle, Renish, Klump, and Brenham soils have formed in Oakville Sand. Soils formed in the Fleming Formation are mainly of the clayey Bleiblerville, Frelsburg, and Latium series. Soils that formed from parent material of the Oakville Sandstone and Fleming Formations are mixed together, indicating dissection and stratification of the beds.

The Quaternary System in Washington County consists of the Willis Formation, fluviatile terraces, and alluvium.

Scattered outcrops of the Willis Formation form hilltops and ridges in the southern extremities of the county. The soils that formed in this formation in Washington County mostly have a darker surface layer than that of soils elsewhere in this formation. The dominant soils are Knolle and Klump soils. The soils in this formation are characterized by their large amounts of coarse sand grains.

Terrace deposits and alluvium are composed of sand, silt, clay, and gravel materials, which overlap bedrock along the Brazos River and smaller streams. Soils of the fluviatile terraces are of the Padina, Tremona, Silawa, Burleson, and Lufkin series. Soils that formed in alluvium on the Brazos River flood plain are reddish Brazoria, Belk, Oklared, Norwood, Asa, Clemville, and Kiomatia soils. Soils formed in alluvium along smaller streams are in the Trinity, Bosque, Gowen, Kaufman, and Nahatche series.

topography

Topography, or relief, affects soil formation by its influence on drainage, erosion, plant cover, and soil temperature. The soils in Washington County range from nearly level to steep, but most of the county is gently sloping.

time

Time, usually a long time, is required for the formation of soils with distinct horizons. The amount of time that parent material has been in place is generally reflected in the degree of development of the soil profile. The soils in Washington County range from young to old. The young soils have little horizon development, and the old soils have well defined soil horizons. Nahatche soils are

an example of young soils; they have little horizon development. Except for a slight accumulation of organic matter and a darkening of the surface layer, Nahatche soils retain most of the characteristics of their stratified parent material. Axtell soils are older soils. They have distinct A and Bt horizons that bear little resemblance to the original parent material.

processes of soil horizon differentiation

Several processes were involved in the development of horizons in the soils of Washington County. The three main processes were accumulation of organic matter, leaching of calcium carbonates and bases, and formation and translocation of silicate clay minerals. In most soils more than one of these processes have been active in the development of horizons.

The accumulation of organic matter in the upper part of the soil to form an A1 horizon has been important. The soils in Washington County range from low to high in organic matter content.

Calcium carbonate has been leached from most of the soils in general soil map units 5, 6, 7, and 8. The rest of the soils are mostly calcareous throughout. This process contributes to the development of distinct horizons.

In many soils of Washington County, the downward translocation of clay minerals has also contributed to horizon development. The Axtell, Silawa, and Tremona soils have accumulations of translocated silicate clays in the Bt horizon. The Bt horizon in these soils contains appreciably more silicate clay than the A horizon.

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glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coeffecient of linear extensibility (COLE). A quantitative method of determining shrink-swell behavior of soil. It is an estimate of the vertical component of swelling of a natural soil clod. COLE is expressed as: low (00.03), moderate (0.03-0.06), and high (00.06).

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—
Loose.—Noncoherent when dry or moist; does not hold together in a mass.
Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation

application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Tuffaceous. Containing up to 50 percent tuff.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the low lands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvial deposited by heavily loaded streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-1976 at Brenham, Texas]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	61.1	39.2	50.2	82	17	135	2.43	0.93	3.62	5	0.1
February---	64.8	41.9	53.4	84	22	165	2.96	1.23	4.35	6	.4
March------	71.9	48.2	60.0	89	28	334	2.06	.65	3.16	4	.0
April------	79.5	57.3	68.4	91	37	552	4.18	2.05	5.90	5	.0
May--------	85.8	64.1	75.0	96	49	775	4.46	1.92	6.52	6	.0
June-------	92.4	70.0	81.2	101	59	936	3.41	.57	5.56	4	.0
July-------	96.1	72.5	84.3	104	66	1,063	1.95	.56	3.06	4	.0
August-----	96.5	72.1	84.3	105	64	1,063	2.87	.77	4.55	4	.0
September--	90.6	67.5	79.1	102	53	873	4.45	1.48	6.81	6	.0
October----	82.5	57.3	69.9	95	40	617	3.77	1.05	5.96	4	.0
November---	71.1	47.4	59.3	88	27	296	3.74	1.58	5.48	6	.1
December---	63.5	41.3	52.4	83	21	152	3.37	1.84	4.62	6	.0
Yearly:											
Average--	79.7	56.6	68.1	---	---	---	---	---	---	---	---
Extreme--	---	---	---	106	16	---	---	---	---	---	---
Total----	---	---	---	---	---	6,961	39.65	29.37	49.20	60	.6

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-1976 at Brenham, Texas]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	February 23	March 10	March 27
2 years in 10 later than--	February 13	February 28	March 18
5 years in 10 later than--	January 26	February 10	March 1
First freezing temperature in fall:			
1 year in 10 earlier than--	December 8	November 19	November 5
2 years in 10 earlier than--	December 17	November 29	November 14
5 years in 10 earlier than--	January 5	December 16	November 30

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-1976
at Brenham, Texas]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	305	272	237
8 years in 10	314	284	249
5 years in 10	337	307	274
2 years in 10	>365	331	299
1 year in 10	>365	347	311

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Arol fine sandy loam, 1 to 5 percent slopes	4,600	1.2
2	Asa silt loam, 0 to 1 percent slopes	780	0.2
3	Axtell fine sandy loam, 1 to 5 percent slopes	3,600	0.9
4	Axtell fine sandy loam, 5 to 12 percent slopes	860	0.2
5	Belk clay, 0 to 1 percent slopes	730	0.2
6	Bleiblerville clay, 1 to 3 percent slopes	17,200	4.4
7	Bleiblerville clay, 3 to 5 percent slopes	6,000	1.5
8	Bosque clay loam, frequently flooded	18,500	4.7
9	Brazoria clay, 0 to 1 percent slopes	11,700	3.0
10	Brazoria clay, 1 to 3 percent slopes	1,520	0.4
11	Brenham clay loam, 3 to 8 percent slopes	13,500	3.4
12	Burleson clay, 0 to 1 percent slopes	850	0.2
13	Burleson clay, 1 to 3 percent slopes	770	0.2
14	Burlewash fine sandy loam, 1 to 5 percent slopes	7,760	2.0
15	Burlewash fine sandy loam, 5 to 20 percent slopes	980	0.2
16	Burlewash-Gullied land complex, 5 to 20 percent slopes	660	0.2
17	Burlewash-Koether association, steep	1,490	0.4
18	Carbengle clay loam, 1 to 3 percent slopes	3,660	0.9
19	Carbengle clay loam, 3 to 5 percent slopes	12,750	3.2
20	Carbengle clay loam, 5 to 8 percent slopes	12,770	3.2
21	Chazos loamy fine sand, 1 to 5 percent slopes	17,080	4.3
22	Chazos loamy fine sand, 5 to 8 percent slopes	1,100	0.3
23	Clemville silt loam, 0 to 1 percent slopes	2,300	0.6
24	Clemville silt loam, 1 to 3 percent slopes	710	0.2
25	Crockett fine sandy loam, 1 to 5 percent slopes	15,250	3.9
26	Crockett fine sandy loam, 5 to 10 percent slopes, eroded	1,800	0.5
27	Cuero sandy clay loam, 1 to 3 percent slopes	890	0.2
28	Cuero sandy clay loam, 3 to 5 percent slopes	2,340	0.6
29	Cuero sandy clay loam, 5 to 8 percent slopes	1,520	0.4
30	Falba fine sandy loam, 1 to 5 percent slopes	20,570	5.2
31	Frelsburg clay, 1 to 3 percent slopes	17,600	4.5
32	Frelsburg clay, 3 to 5 percent slopes	32,558	8.5
33	Frelsburg clay, 5 to 8 percent slopes	11,760	3.0
34	Gowen clay loam, frequently flooded	2,560	0.7
35	Greenvine clay, 1 to 3 percent slopes	1,730	0.4
36	Greenvine clay, 3 to 5 percent slopes	3,660	0.9
37	Kaufman clay,frequently flooded	3,980	1.0
38	Kiomatia and Norwood soils, frequently flooded	1,570	0.4
39	Klump loamy sand, 1 to 3 percent slopes	2,800	0.7
40	Klump loamy sand, 3 to 5 percent slopes	4,340	1.1
41	Klump loamy sand, 5 to 8 percent slopes	3,310	0.8
42	Knolle coarse sand, 2 to 8 percent slopes	3,230	0.8
43	Latium clay, 3 to 5 percent slopes	4,180	1.1
44	Latium clay, 5 to 8 percent slopes	11,000	2.8
45	Latium clay, 4 to 12 percent slopes, eroded	5,540	1.4
46	Lufkin fine sandy loam, 0 to 1 percent slopes	5,380	1.4
47	Mabank fine sandy loam, 0 to 1 percent slopes	1,160	0.3
48	Mabank fine sandy loam, 1 to 3 percent slopes	4,400	1.1
49	Nahatche clay loam, frequently flooded	2,300	0.6
50	Norwood silt loam, 0 to 1 percent slopes	1,300	0.3
51	Oklared very fine sandy loam, 0 to 1 percent slopes	1,160	0.3
52	Oklared-Norwood complex, occasionally flooded	1,230	0.3
53	Padina loamy fine sand, 1 to 5 percent slopes	5,570	1.4
54	Pits	540	0.1
55	Rehburg loamy fine sand, 1 to 5 percent slopes	5,180	1.3
56	Renish clay loam, 1 to 5 percent slopes	3,440	0.9
57	Renish clay loam, 5 to 12 percent slopes	1,590	0.4
58	Renish-Rock outcrop complex, 1 to 12 percent slopes	2,200	0.6
59	Shalba fine sandy loam, 1 to 5 percent slopes	1,480	0.4
60	Shalba-Rock outcrop complex, 1 to 8 percent slopes	610	0.2
61	Silawa loamy fine sand, 1 to 5 percent slopes	5,600	1.4
62	Silawa loamy fine sand, 5 to 8 percent slopes	1,120	0.3
63	Sumpf clay, frequently flooded	830	0.2
64	Tabor fine sandy loam, 1 to 5 percent slopes	9,170	2.3
65	Tabor very gravelly fine sandy loam, 1 to 5 percent slopes	1,150	0.3
66	Tremona loamy fine sand, 1 to 5 percent slopes	9,110	2.3
67	Tremona loamy fine sand, 5 to 8 percent slopes	930	0.2
68	Trinity clay, occasionally flooded	1,020	0.3
69	Trinity clay, frequently flooded	16,600	4.2
70	Trinity clay, depressional	1,190	0.3
71	Wilson clay loam, 0 to 1 percent slopes	1,330	0.3
72	Wilson clay loam, 1 to 3 percent slopes	6,340	1.6

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
	Water	6,972	1.8
	Total	392,960	100.0

TABLE 5. YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. Only soils suitable for these crops are listed.

Map symbol and soil name	Corn	Grain Sorghum	Cotton lint	Bermudagrass		Bahiagrass	Kleingrass
				Improved	Common		
	Bu	Bu	Lb	AUM*	AUM*	AUM*	AUM*
1---------- Arol	---	---	---	4.0	3.0	3.0	---
2---------- Asa	110	110	650	10.0	7.0	6.0	8.0
3---------- Axtell	---	---	---	5.0	4.0	4.0	4.0
4---------- Axtell	---	---	---	4.0	4.0	4.0	4.0
5---------- Belk	---	80	500	8.0	6.0	---	8.0
6---------- Bleiblerville	60	75	400	8.0	5.0	---	8.0
7---------- Bleiblerville	45	60	300	8.0	5.0	---	8.0
8---------- Bosque	---	---	---	7.5	6.0	---	7.5
9---------- Brazoria	80	90	500	9.0	7.0	---	8.0
10---------- Brazoria	50	85	450	9.0	7.0	---	8.0
11---------- Brenham	35	60	---	6.0	4.0	---	6.0
12---------- Burleson	65	85	450	8.0	5.0	6.0	6.0
13---------- Burleson	65	80	450	8.0	5.0	6.0	6.0
14---------- Burlewash	---	---	---	6.0	3.0	3.0	---
15---------- Burlewash	---	---	---	4.0	2.5	3.0	---
17:**							
Burlwash part----------	---	---	---	5.0	4.0	4.0	---
Koether part----------	---	---	---	---	---	---	---
18---------- Carbengle	40	---	---	7.0	5.0	---	7.0
19---------- Carbengle	35	---	---	6.0	4.0	---	6.0
20---------- Carbengle	---	---	---	5.0	4.0	---	5.0
21---------- Chazos	---	40	---	7.0	6.0	6.0	7.0

See footnotes at end of table.

TABLE 5. YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Corn	Grain Sorghum	Cotton lint	Bermudagrass		Bahiagrass	Kleingrass
				Improved	Common		
	Bu	Bu	Lb	AUM*	AUM*	AUM*	AUM*
22--Chazos	---	30	---	6.5	5.0	5.0	6.5
23--Chemville	90	90	600	9.0	7.5	---	8.0
24--Chemville	80	85	550	9.0	7.5	---	8.0
25--Crockett	30	45	200	6.5	5.0	5.0	6.5
26--Crockett	---	---	---	5.0	4.0	4.0	5.0
27--Cuero	45	50	350	8.0	6.5	---	8.0
28--Cuero	35	40	300	7.0	5.5	---	7.0
29--Cuero	---	35	---	6.0	4.5	---	6.0
30--Falba	---	---	---	5.0	4.0	3.0	---
31--Frelsburg	55	70	400	7.0	4.0	---	7.0
32--Frelsburg	40	55	300	7.0	4.0	---	7.0
33--Frelsburg	30	30	---	6.0	3.5	---	6.0
34--Gowen	---	---	---	8.0	6.5	6.5	6.0
35--Greenvine	50	80	300	8.0	6.5	5.0	7.0
36--Greenvine	40	55	250	7.0	5.0	5.0	7.0
37--Kaufman	---	---	---	8.5	6.0	6.0	8.0
38--Kiomatia and Norwood	---	---	---	8.0	6.5	---	---
39--Klump	45	50	---	7.0,	6.0	7.0	7.0
40--Klump	35	45	---	6.5	6.0	6.5	7.0
41--Klump	20	---	---	6.5	5.0	6.0	6.5
42--Knolle	---	---	---	6.5	5.5	---	6.5
43--Latium	---	---	---	5.5	4.0	---	5.5
44--Latium	---	---	---	4.5	4.0	---	4.5

See footnotes at end of table.

TABLE 5. YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Corn	Grain Sorghum	Cotton lint	Bermudagrass		Bahiagrass	Kleingrass
				Improved	Common		
	Bu	Bu	Lb	AUM*	AUM*	AUM*	AUM*
45--Latium	---	---	---	4.0	---	---	4.0
46--Lufkin	35	---	---	5.0	---	4.0	4.0
47--Mabank	40	55	330	6.0	5.0	5.0	6.5
48--Mabank	35	45	300	6.0	5.0	5.0	6.5
49--Nahatche	---	---	---	9.0	5.0	8.0	---
50--Norwood	110	90	600	10.0	7.0	---	8.0
51--Oklared	90	65	650	8.0	6.5	---	8.0
52--Oklared-Norwood	90	78	625	9.0	7.0	---	9.0
53--Padina	---	---	---	7.0	---	4.0	---
55--Rehburg	---	---	---	6.0	4.0	4.0	6.0
56--Renish	---	---	---	4.0	---	---	4.0
57--Renish	---	---	---	4.0	---	---	3.0
59--Shalba	---	---	---	4.0	---	3.0	4.0
61--Silawa	45	50	350	6.0	4.0	5.0	6.0
62--Silawa	---	---	---	5.0	3.5	4.0	5.0
63--Sumpf	---	---	---	3.5	---	---	---
64--Tabor	35	35	---	7.0	6.0	6.0	7.0
65--Tabor	---	---	---	4.5	3.0	4.0	4.5
66--Tremona	---	---	---	5.5	---	4.0	---
67--Tremona	---	---	---	4.5	---	3.5	---
68--Trinity	60	100	450	8.0	6.0	---	7.0
69--Trinity	---	---	---	8.0	6.0	---	7.0
70--Trinity	---	---	---	8.0	5.0	---	---

See footnotes at end of table.

TABLE 5. YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Corn	Grain Sorghum	Cotton lint	Bermudagrass		Bahiagrass	Kleingrass
				Improved	Common		
	Bu	Bu	Lb	AUM*	AUM*	AUM*	AUM*
71---------- Wilson	45	55	350	6.0	5.0	5.0	6.0
72---------- Wilson	35	45	300	6.0	5.0	5.0	6.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion	Wetness	Soil problem	Climate
III	130,938	119,108	7,870	3,960	---
IV	115,740	115,740	---	---	---
V	45,915	---	45,915	---	---
VI	17,025	15,045	830	1,150	---
VII	685	---	---	685	---
VIII	---	---	---	---	---

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Map symbol and soil name	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
1 Arol	Claypan Savannah	Favorable Normal Unfavorable	5,500 4,500 2,500	Little bluestem Indiangrass Brownseed paspalum Purpletop Post oak Blackjack oak	40 10 10 5 5 5
2 Asa	Loamy Bottomland	Favorable Normal Unfavorable	8,000 6,500 5,000	Virginia wildrye Indiangrass Little bluestem Beaked panicum Switchgrass Sedge Eastern cottonwood American elm Big bluestem Rustyseed paspalum	15 10 10 10 10 10 10 10 5 5
3, 4 Axtell	Claypan Savannah	Favorable Normal Unfavorable	5,500 4,500 2,500	Little bluestem Indiangrass Brownseed paspalum Purpletop Post oak Blackjack oak	25 10 10 5 5 5
5 Belk	Clayey Bottomland	Favorable Normal Unfavorable	7,500 6,000 4,000	Virginia wildrye Sedge Beaked panicum Eastern gamagrass Panicum Eastern cottonwood American elm Rustyseed paspalum Switchgrass Buffalograss Hackberry	15 10 10 10 10 10 10 5 5 5 5
6, 7 Bleiblerville	Blackland	Favorable Normal Unfavorable	7,500 6,000 4,500	Little bluestem Indiangrass Big bluestem Eastern gamagrass Switchgrass	50 10 10 5 5
8 Bosque	Loamy Bottomland	Favorable Normal Unfavorable	8,000 6,500 5,000	Virginia wildrye Indiangrass Little bluestem Beaked panicum Switchgrass Sedge Eastern cottonwood American elm Big bluestem Rustyseed paspalum	15 10 10 10 10 10 10 10 5 5
9, 10 Brazoria	Clayey Bottomland	Favorable Normal Unfavorable	7,500 6,000 4,000	Virginia wildrye Sedge Beaked panicum Eastern gamagrass Panicum Eastern cottonwood American elm Rustyseed paspalum Switchgrass Buffalograss Hackberry	15 10 10 10 10 10 10 5 5 5 5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Map symbol and soil name	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
11---------- Brenham	Clay Loam----------	Favorable	6,500	Little bluestem----------	40
		Normal	4,500	Indiangrass----------	15
		Unfavorable	3,000	Big bluestem----------	15
				Sideoats grama----------	15
				Switchgrass----------	5
				Silver bluestem----------	5
12, 13---------- Burleson	Blackland----------	Favorable	7,500	Little bluestem----------	50
		Normal	6,000	Indiangrass----------	10
		Unfavorable	4,500	Big bluestem----------	10
				Eastern gamagrass----------	5
				Switchgrass----------	5
14, 15---------- Burlewash	Claypan Savannah----------	Favorable	5,500	Little bluestem----------	40
		Normal	4,000	Indiangrass----------	10
		Unfavorable	2,500	Brownseed paspalum----------	10
				Purpletop----------	5
				Post oak----------	5
				Blackjack oak----------	5
16:*					
Burlewash part----	Claypan Savannah	Favorable	5,500	Little bluestem----------	40
		Normal	4,000	Indiangrass----------	10
		Unfavorable	2,500	Brownseed paspalum----------	10
				Purpletop----------	5
				Post oak----------	5
				Blackjack oak----------	5
Gullied land part.					
17:*					
Burlewash part----	Claypan Savannah----------	Favorable	5,500	Little bluestem----------	40
		Normal	4,000	Indiangrass----------	10
		Unfavorable	2,500	Brownseed paspalum----------	10
				Purpletop----------	5
				Post oak----------	5
				Blackjack oak----------	5
Koether part------	Claypan Savannah----------	Favorable	5,500	Little bluestem----------	40
		Normal	4,000	Indiangrass----------	10
		Unfavorable	2,500	Brownseed paspalum----------	10
				Purpletop----------	5
				Post oak----------	5
				Blackjack oak----------	5
18, 19, 20--------- Carbengle	Clay Loam----------	Favorable	6,500	Little bluestem----------	40
		Normal	4,500	Indiangrass----------	15
		Unfavorable	3,000	Big bluestem----------	15
				Sideoats grama----------	15
				Switchgrass----------	5
				Silver bluestem----------	5
21, 22---------- Chazos	Loamy sand----------	Favorable	5,500	Little bluestem----------	40
		Normal	4,500	Purpletop----------	5
		Unfavorable	3,000	Switchgrass----------	5
				Beaked panicum----------	5
				Sand lovegrass----------	5
				Brownseed paspalum----------	5
				Indiangrass----------	5
				Longleaf uniola----------	5
				Panicum----------	5
				Post oak----------	5
				Blackjack oak----------	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Map symbol and soil name	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
23, 24---------- Clemville	Loamy Bottomland----------	Favorable	8,000	Virginia wildrye----------	15
		Normal	6,500	Indiangrass----------	10
		Unfavorable	5,000	Little bluestem----------	10
				Beaked panicum----------	10
				Switchgrass----------	10
				Sedge----------	10
				Eastern cottonwood----------	10
				American elm----------	10
				Big bluestem----------	5
				Rustyseed paspalum----------	5
25, 26---------- Crockett	Claypan Prairie----------	Favorable	6,000	Little bluestem----------	50
		Normal	5,000	Indiangrass----------	15
		Unfavorable	3,000	Big bluestem----------	10
				Switchgrass----------	5
				Virginia wildrye----------	5
				Texas needlegrass----------	5
				Meadow dropseed----------	5
27, 28, 29--------- Cuero	Clay Loam----------	Favorable	6,500	Little bluestem----------	40
		Normal	4,500	Indiangrass----------	15
		Unfavorable	3,000	Big bluestem----------	15
				Sideoats grama----------	15
				Switchgrass----------	5
				Silver bluestem----------	5
30---------- Falba	Claypan Savannah----------	Favorable	5,500	Little bluestem----------	40
		Normal	4,000	Indiangrass----------	10
		Unfavorable	2,500	Brownseed paspalum----------	10
				Purpletop----------	5
				Post oak----------	5
				Blackjack oak----------	5
31, 32, 33--------- Frelsburg	Blackland----------	Favorable	7,500	Little bluestem----------	50
		Normal	6,000	Big bluestem----------	10
		Unfavorable	4,500	Indiangrass----------	10
				Eastern gamagrass----------	5
				Switchgrass----------	5
34---------- Gowen	Loamy Bottomland----------	Favorable	8,000	Virginia wildrye----------	15
		Normal	6,500	Indiangrass----------	10
		Unfavorable	5,000	Little bluestem----------	10
				Beaked panicum----------	10
				Switchgrass----------	10
				Sedge----------	10
				Eastern cottonwood----------	10
				American elm----------	10
				Big bluestem----------	5
				Rustyseed paspalum----------	5
35, 36---------- Greenvine	Blackland----------	Favorable	7,500	Little bluestem----------	50
		Normal	6,000	Indiangrass----------	10
		Unfavorable	4,500	Big bluestem----------	10
				Eastern gamagrass----------	5
				Switchgrass----------	5
37---------- Kaufman	Clayey Bottomland----------	Favorable	7,500	Virginia wildrye----------	15
		Normal	6,000	Sedge----------	10
		Unfavorable	4,000	Beaked panicum----------	10
				Eastern gamagrass----------	10
				Panicum----------	10
				Eastern cottonwood----------	10
				American elm----------	10
				Rustyseed paspalum----------	5
				Switchgrass----------	5
				Buffalograss----------	5
				Hackberry----------	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Map symbol and soil name	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
38:*					
Kiomatia part	Sandy Bottomland	Favorable	5,000	Beaked panicum	20
		Normal	4,000	Giant cane	20
		Unfavorable	2,500	Sedge	10
				Virginia wildrye	10
				Purpletop	10
				Longleaf uniola	5
Norwood part	Loamy Bottomland	Favorable	8,000	Virginia wildrye	15
		Normal	6,500	Indiangrass	10
		Unfavorable	5,000	Little bluestem	10
				Beaked panicum	10
				Switchgrass	10
				Eastern cottonwood	10
				American elm	10
				Big bluestem	5
				Rustyseed paspalum	5
39, 40 Klump	Sandy loam	Favorable	6,500	Little bluestem	50
		Normal	5,500	Indiangrass	10
		Unfavorable	3,500	Blackjack oak	10
				Post oak	10
				Purpletop	5
				Brownseed paspalum	5
41 Klump	Sandy Loam	Favorable	6,500	Little bluestem	40
		Normal	5,000	Indiangrass	30
		Unfavorable	3,000	Sideoats grama	5
				Silver bluestem	5
				Sedges	5
				Hackberry	3
				Winged elm	2
42 Knolle	Sandy loam	Favorable	6,500	Little bluestem	50
		Normal	5,500	Indiangrass	10
		Unfavorable	3,500	Blackjack oak	10
				Post oak	10
				Purpletop	5
				Brownseed paspalum	5
43, 44, 45 Latium	Eroded Blackland	Favorable	7,000	Little bluestem	35
		Normal	5,500	Indiangrass	15
		Unfavorable	4,000	Big bluestem	10
				Sideoats grama	7
				Switchgrass	5
				Florida paspalum	5
				Virginia wildrye	5
				Texas needlegrass	5
				Meadow dropseed	5
46 Lufkin	Claypan Savannah	Favorable	5,500	Little bluestem	40
		Normal	4,000	Indiangrass	10
		Unfavorable	2,500	Brownseed paspalum	10
				Purpletop	5
				Post oak	5
				Blackjack oak	5
47, 48 Mabank	Claypan Prairie	Favorable	6,000	Little bluestem	50
		Normal	5,000	Indiangrass	15
		Unfavorable	3,000	Big bluestem	10
				Switchgrass	5
				Virginia wildrye	5
				Texas needlegrass	5
				Meadow dropseed	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Map symbol and soil name	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
49---------- Nahatche	Loamy Bottomland----------	Favorable	8,000	Virginia wildrye----------	15
		Normal	6,500	Indiangrass----------	10
		Unfavorable	5,000	Little bluestem----------	10
				Beaked panicum----------	10
				Switchgrass----------	10
				Sedge----------	10
				Eastern cottonwood----------	10
				American elm----------	10
				Big bluestem----------	5
				Rustyseed paspalum----------	5
50---------- Norwood	Loamy Bottomland----------	Favorable	8,000	Virginia wildrye----------	15
		Normal	6,500	Indiangrass----------	10
		Unfavorable	5,000	Little bluestem----------	10
				Beaked panicum----------	10
				Switchgrass----------	10
				Sedge----------	10
				Eastern cottonwood----------	10
				American elm----------	10
				Big bluestem----------	5
				Rustyseed paspalum----------	5
51---------- Oklared	Loamy Bottomland----------	Favorable	8,000	Virginia wildrye----------	15
		Normal	6,500	Indiangrass----------	10
		Unfavorable	5,000	Little bluestem----------	10
				Beaked panicum----------	10
				Switchgrass----------	10
				Sedge----------	10
				Eastern cottonwood----------	10
				American elm----------	10
				Big bluestem----------	5
				Rustyseed paspalum----------	5
52:*					
Oklared part------	Loamy Bottomland----------	Favorable	8,000	Virginia wildrye----------	15
		Normal	6,500	Indiangrass----------	10
		Unfavorable	5,000	Little bluestem----------	10
				Beaked panicum----------	10
				Switchgrass----------	10
				Sedge----------	10
				Eastern cottonwood----------	10
				American elm----------	10
				Big bluestem----------	5
				Rustyseed paspalum----------	5
Norwood----------	Loamy Bottomland----------	Favorable	8,000	Virginia wildrye----------	15
		Normal	6,500	Indiangrass----------	10
		Unfavorable	5,000	Little bluestem----------	10
				Beaked panicum----------	10
				Switchgrass----------	10
				Sedge----------	10
				Eastern cottonwood----------	10
				American elm----------	10
				Big bluestem----------	5
				Rustyseed paspalum----------	5
53---------- Padina	Deep Sand----------	Favorable	4,500	Little bluestem----------	45
		Normal	3,500	Purpletop----------	10
		Unfavorable	2,250	Paspalum----------	10
				Panicum----------	5
				Sand lovegrass----------	5
				Indiangrass----------	5
				Longleaf uniola----------	5
				Bluejack oak----------	5
				Post oak----------	5
				Blackjack oak----------	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Map symbol and soil name	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
55---------- Rehburg	Sandy----------	Favorable	4,000	Little bluestem----------	50
		Normal	3,000	Indiangrass----------	10
		Unfavorable	1,500	Post oak----------	10
				Switchgrass----------	5
				Tall dropseed----------	5
				Blackjack oak----------	5
				Yaupon----------	5
				Brownseed paspalum----------	5
56, 57---------- Renish	Chalky Ridge----------	Favorable	3,000	Little bluestem----------	55
		Normal	2,000	Indiangrass----------	15
		Unfavorable	1,000	Sideoats grama----------	5
				Silver bluestem----------	5
				Live oak----------	5
				Sideoats grama----------	5
58:*					
Renish part-------	Chalky Ridge----------	Favorable	3,000	Little bluestem----------	55
		Normal	2,000	Indiangrass----------	15
		Unfavorable	1,000	Sideoats grama----------	5
				Silver bluestem----------	5
				Live oak----------	5
				Sideoats grama----------	5
Rock outcrop part.					
59---------- Shalba	Claypan Savannah----------	Favorable	5,500	Little bluestem----------	40
		Normal	4,000	Indiangrass----------	10
		Unfavorable	2,500	Brownseed paspalum----------	10
				Purpletop----------	5
				Post oak----------	5
				Blackjack oak----------	5
60:*					
Shalba part-------	Claypan Savannah----------	Favorable	5,500	Little bluestem----------	40
		Normal	4,000	Indiangrass----------	10
		Unfavorable	2,500	Brownseed paspalum----------	10
				Purpletop----------	5
				Post oak----------	5
				Blackjack oak----------	5
Rock outcrop part.					
61, 62---------- Silawa	Loamy Sand----------	Favorable	5,500	Little bluestem----------	40
		Normal	4,500	Purpletop----------	5
		Unfavorable	3,000	Switchgrass----------	5
				Beaked panicum----------	5
				Sand lovegrass----------	5
				Brownseed paspalum----------	5
				Indiangrass----------	5
				Longleaf uniola----------	5
				Panicum----------	5
				Post oak----------	5
				Blackjack oak----------	5
63---------- Sumpf	Clayey Bottomland----------	Favorable	7,500	Virginia wildrye----------	15
		Normal	6,000	Sedge----------	10
		Unfavorable	4,000	Beaked panicum----------	10
				Eastern gamagrass----------	10
				Panicum----------	10
				Eastern cottonwood----------	10
				American elm----------	10
				Rustyseed paspalum----------	5
				Switchgrass----------	5
				Buffalograss----------	5
				Hackberry----------	5

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Map symbol and soil name	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
64---------- Tabor	Sandy Loam----------	Favorable Normal Unfavorable	6,500 5,500 3,500	Little bluestem---------- Indiangrass---------- Blackjack oak---------- Post oak---------- Purpletop---------- Brownseed paspalum----------	50 10 10 10 5 5
65---------- Tabor	Gravelly----------	Favorable Normal Unfavorable	4,500 3,500 2,000	Little bluestem---------- Indiangrass---------- Brownseed paspalum---------- Blackjack oak---------- Purpletop---------- Post oak----------	50 10 10 10 5 5
66, 67---------- Tremona	Sandy----------	Favorable Normal Unfavorable	4,000 3,000 1,500	Little bluestem---------- Indiangrass---------- Post oak---------- Switchgrass---------- Brownseed paspalum---------- Tall dropseed---------- Blackjack oak---------- Yaupon----------	50 10 10 5 5 5 5 5
68, 69, 70--------- Trinity	Clayey Bottomland----------	Favorable Normal Unfavorable	7,500 6,000 4,000	Virginia wildrye---------- Sedge---------- Beaked panicum---------- Eastern gamagrass---------- Panicum---------- Eastern cottonwood---------- American elm---------- Rustyseed paspalum---------- Switchgrass---------- Buffalograss---------- Hackberry----------	15 10 10 10 10 10 10 5 5 5 5
71, 72---------- Wilson	Claypan Prairie----------	Favorable Normal Unfavorable	6,000 5,000 3,000	Little bluestem---------- Indiangrass---------- Big bluestem---------- Virginia wildrye---------- Texas needlegrass---------- Switchgrass---------- Meadow dropseed----------	50 15 10 5 5 5 5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1---------- Arol	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
2---------- Asa	Severe: floods.	Slight----------	Slight----------	Slight----------	Slight.
3---------- Axtell	Moderate: percs slowly.	Slight----------	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
4---------- Axtell	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
5---------- Belk	Severe: floods, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: percs slowly, too clayey.	Severe: too clayey.	Severe: too clayey.
6, 7---------- Bleiblerville	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Severe: too clayey.	Moderate: too clayey.	Severe: too clayey.
8---------- Bosque	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
9, 10---------- Brazoria	Severe: floods, wetness, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: too clayey.	Severe: too clayey.
11---------- Brenham	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, slope.	Moderate: too clayey.	Slight.
12---------- Burleson	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: small stones, too clayey.	Moderate: too clayey.	Severe: too clayey.
13---------- Burleson	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, small stones, too clayey.	Moderate: too clayey.	Severe: too clayey.
14---------- Burlewash	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly, depth to rock.	Severe: erodes easily.	Moderate: thin layer.
15---------- Burlewash	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
16:* Burlewash part--------	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
Gullied land part.					

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
17:*					
Burlewash part	Moderate: slope.	Moderate: slope.	Severe:	Severe:	Moderate: thin layer.
Koether part	Severe: large stones, slope, depth to rock.	Severe: large stones, slope.	Severe: slope, large stones, depth to rock.	Severe: large stones, slope.	Severe: large stones, slope, thin layer.
18, 19--- Carbengle	Slight	Slight	Moderate: slope, depth to rock.	Slight	Moderate: thin layer.
20--- Carbengle	Slight	Slight	Severe: slope.	Slight	Moderate: thin layer.
21--- Chazos	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
22--- Chazos	Slight	Slight	Severe: slope.	Slight	Slight.
23, 24--- Clemville	Severe: floods.	Moderate: percs slowly.	Moderate: percs slowly.	Severe: erodes easily.	Slight.
25--- Crockett	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
26--- Crockett	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
27, 28--- Cuero	Slight	Slight	Moderate: slope.	Slight	Slight.
29--- Cuero	Slight	Slight	Severe: slope.	Slight	Slight.
30--- Falba	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
31, 32--- Frelsburg	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Severe: too clayey.	Moderate: too clayey.	Severe: too clayey.
33--- Frelsburg	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Severe: slope, too clayey.	Moderate: too clayey.	Severe: too clayey.
34--- Gowen	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
35, 36--- Greenvine	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.	Moderate: too clayey.	Severe: too clayey.
37--- Kaufman	Severe: floods, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, floods.	Severe: wetness, too clayey.	Severe: wetness, floods, too clayey.
38:*					
Kiomatia part	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
Norwood part	Slight	Moderate: floods.	Severe: floods.	Severe: erodes easily.	Severe: floods.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
39, 40---- Klump	Slight----	Slight----	Moderate: slope.	Slight----	Slight.
41---- Klump	Slight----	Slight----	Severe: slope.	Slight----	Slight.
42---- Knolle	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
43---- Latium	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Severe: too clayey.	Moderate: too clayey.	Severe: too clayey.
44---- Latium	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Severe: slope, too clayey.	Moderate: too clayey.	Severe: too clayey.
45---- Latium	Moderate: too clayey, percs slowly, slope.	Moderate: too clayey, slope, percs slowly.	Severe: slope, too clayey.	Moderate: too clayey, slope.	Severe: too clayey.
46---- Lufkin	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
47, 48---- Mabank	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
49---- Nahatche	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
50---- Norwood	Slight----	Slight----	Slight----	Severe: erodes easily.	Slight.
51---- Oklared	Severe: floods.	Slight----	Slight----	Slight----	Slight.
52:*					
Oklared part----	Severe: floods.	Slight----	Moderate: floods.	Slight----	Moderate: floods.
Norwood part----	Slight----	Slight----	Moderate: floods.	Slight----	Moderate: floods.
53---- Padina	Slight----	Slight----	Moderate: slope.	Slight----	Moderate: droughty.
54.* Pits					
55---- Rehburg	Moderate: too sandy, percs slowly, wetness.	Moderate: too sandy, wetness, percs slowly.	Moderate: slope, wetness, too sandy.	Moderate: too sandy.	Moderate: wetness.
56---- Renish	Severe: depth to rock.	Moderate: small stones.	Severe: small stones, depth to rock.	Moderate: small stones.	Severe: depth to rock.
57---- Renish	Severe: depth to rock.	Moderate: small stones.	Severe: small stones, depth to rock, slope.	Moderate: small stones.	Severe: depth to rock.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
58:*					
Renish part	Severe: depth to rock.	Moderate: small stones.	Severe: small stones, depth to rock, slope.	Moderate: small stones.	Severe: depth to rock.
Rock outcrop part.					
59---------- Shalba	Severe: wetness, depth to rock, percs slowly.	Severe: wetness, percs slowly, depth to rock.	Severe: wetness, percs slowly, depth to rock.	Severe: wetness, erodes easily.	Severe: wetness, thin layer.
60:					
Shalba part	Severe: wetness, depth to rock, percs slowly.	Severe: wetness, percs slowly, depth to rock.	Severe: wetness, percs slowly, depth to rock.	Severe: wetness, erodes easily.	Severe: wetness, thin layer.
Rock outcrop part.					
61---------- Silawa	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Slight.
62---------- Silawa	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
63---------- Sumpf	Severe: floods, wetness, percs slowly.	Severe: wetness, floods, too clayey.	Severe: too clayey, wetness, floods.	Severe: wetness, too clayey.	Severe: wetness, floods, too clayey.
64---------- Tabor	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: erodes easily.	Slight.
65---------- Tabor	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: erodes easily, small stones.	Severe: small stones.
66---------- Tremona	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones.	Moderate: wetness.	Moderate: wetness, droughty.
67---------- Tremona	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Moderate: wetness.	Moderate: wetness, droughty.
68---------- Trinity	Severe: floods, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
69, 70---------- Trinity	Severe: floods, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, floods.	Severe: wetness, too clayey.	Severe: wetness, floods, too clayey.
71, 72---------- Wilson	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1---- Arol	Fair	Good	Fair	Fair	---	Poor	Poor	Fair	Fair	Poor	---
2---- Asa	Good	Good	Fair	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
3---- Axtell	Fair	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
4---- Axtell	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
5---- Belk	Fair	Fair	Good	Good	---	Poor	Poor	Fair	Good	Poor	---
6---- Bleiblerville	Good	Good	Fair	---	Fair	Poor	Poor	Good	---	Poor	Fair.
7---- Bleiblerville	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
8---- Bosque	Very poor.	Poor	Fair	---	Good	Poor	Very poor.	Poor	---	Very poor.	Fair.
9, 10---- Brazoria	Fair	Fair	Fair	Good	Fair	Poor	Fair	Fair	Good	Poor	Fair.
11---- Brenham	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
12, 13---- Burleson	Good	Good	Poor	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
14---- Burlewash	Fair	Good	Good	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
15---- Burlewash	Poor	Fair	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
16:* Burlewash part----	Poor	Fair	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
Gullied land part.											
17:* Burlewash part----	Poor	Fair	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
Koether part----	Very poor.	Very poor.	Very poor.	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Very poor.
18, 19, 20---- Carbengle	Fair	Good	Good	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
21---- Chazos	Fair	Good	Good	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
22---- Chazos	Fair	Good	Good	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
23, 24---- Clemville	Good	Good	Fair	Good	---	Poor	Very poor.	Good	Good	Very poor.	---

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
25--Crockett	Fair	Good	Good	Good	Good	Poor	Poor	Good	---	Poor	Good.
26--Crockett	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
27, 28, 29--Cuero	Good	Good	Good	---	Fair	Poor	Poor	Good	---	Poor	Fair.
30--Falba	Fair	Good	Fair	Fair	---	Poor	Poor	Fair	Fair	Poor	---
31--Frelsburg	Good	Good	Fair	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
32, 33--Frelsburg	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
34--Gowen	Very poor.	Poor	Fair	---	Good	Poor	Very poor.	Poor	---	Very poor.	Fair.
35--Greenvine	Good	Good	Fair	---	Fair	Poor	Poor	Good	---	Poor	Fair.
36--Greenvine	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
37--Kaufman	Poor	Poor	Fair	Good	Fair	Poor	Good	Poor	Good	Fair	---
38:*											
Kiomatia part	Poor	Fair	Fair	Fair	---	Poor	Very poor.	Fair	Fair	Very poor.	---
Norwood part	Good	Good	Fair	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
39, 40, 41--Klump	Fair	Good	Good	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
42--Knolle	Fair	Fair	Good	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
43--Latium	Fair	Good	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
44, 45--Latium	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	---
46--Lufkin	Fair	Good	Fair	Good	---	Fair	Fair	Fair	Good	Fair	---
47, 48--Mabank	Fair	Good	Good	Good	Fair	Fair	Fair	Good	---	Fair	Fair.
49--Nahatche	Very poor.	Poor	Fair	Good	---	Fair	Fair	Poor	Fair	Fair	---
50--Norwood	Good	Good	Fair	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
51--Oklared	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
52:*											
Oklared part	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
52:* Norwood part	Good	Good	Fair	---	Fair	Poor	Very poor.	Good	---	Very poor.	Fair.
53--- Padina	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
54.* Pits											
55--- Rehburg	Fair	Good	Good	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
56, 57--- Renish	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
58:* Renish part	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rock outcrop part.											
59--- Shalba	Poor	Poor	Poor	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Poor.
60:* Shalba part	Poor	Poor	Poor	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Poor.
Rock outcrop part.											
61--- Silawa	Fair	Good	Good	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
62--- Silawa	Fair	Good	Good	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
63--- Sumpf	Very poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Very poor.	Good	---
64--- Tabor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
65--- Tabor	Poor	Fair	Fair	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
66--- Tremona	Fair	Good	Good	Fair	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
67--- Tremona	Fair	Good	Good	Fair	Good	Very poor.	Very poor.	Good	---	Very poor.	Good.
68--- Trinity	Fair	Good	Fair	Good	---	Poor	Fair	Fair	Good	Poor	---
69, 70--- Trinity	Poor	Fair	Fair	Good	---	Poor	Fair	Fair	Fair	Poor	---
71, 72--- Wilson	Fair	Fair	Good	---	Fair	Fair	Fair	Fair	---	Fair	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1---------- Arol	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
2---------- Asa	Slight---------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.	Slight.
3---------- Axtell	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
4---------- Axtell	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
5---------- Belk	Moderate: too clayey.	Severe: floods, shrink-swell.	Severe: floods.	Severe: floods, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
6, 7---------- Bleiblerville	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
8---------- Bosque	Moderate: too clayey, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Severe: floods.
9, 10---------- Brazoria	Severe: cutbanks cave, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
11---------- Brenham	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
12, 13---------- Burleson	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
14---------- Burlewash	Moderate: too clayey, depth to rock.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: thin layer.
15---------- Burlewash	Moderate: too clayey, slope, depth to rock.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope, thin layer.
16:* Burlewash part--- Gullied land part.	Moderate: too clayey, slope, depth to rock.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope, thin layer.
17:* Burlewash part---	Moderate: too clayey, slope, depth to rock.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope, thin layer.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
17:* Koether part	Severe: depth to rock, large stones, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: large stones, slope, thin layer.
18--- Carbengle	Moderate: depth to rock.	Slight---	Moderate: depth to rock.	Slight---	Severe: low strength.	Moderate: thin layer.
19, 20--- Carbengle	Moderate: depth to rock.	Slight---	Moderate: depth to rock.	Moderate: slope.	Severe: low strength.	Moderate: thin layer.
21--- Chazos	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
22--- Chazos	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
23, 24--- Clemville	Moderate: too clayey.	Severe: floods.	Severe: floods, shrink-swell.	Severe: floods.	Severe: low strength.	Slight.
25, 26--- Crockett	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
27--- Cuero	Slight---	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
28, 29--- Cuero	Slight---	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, shrink-swell.	Slight.
30--- Falba	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
31, 32, 33--- Frelsburg	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
34--- Gowen	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Severe: floods.
35, 36--- Greenvine	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
37--- Kaufman	Severe: cutbanks cave, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, floods.	Severe: wetness, floods, too clayey.
38:* Kiomatia part	Severe: floods, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Norwood part	Moderate: floods.	Slight---	Slight---	Slight---	Severe: low strength, floods.	Severe: floods.
39--- Klump	Slight---	Slight---	Slight---	Slight---	Moderate: low strength.	Slight.
40, 41--- Klump	Slight---	Slight---	Slight---	Moderate: slope.	Moderate: low strength.	Slight.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
42---------- Knolle	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: low strength.	Severe: too sandy.
43, 44---------- Latium	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
45---------- Latium	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Severe: too clayey.
46---------- Lufkin	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
47, 48---------- Mabank	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
49---------- Nahatche	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness, floods.	Severe: wetness, floods.
50---------- Norwood	Slight----------	Slight----------	Slight----------	Slight----------	Severe: low strength.	Slight.
51---------- Oklared	Moderate: wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: low strength, floods.	Slight.
52:* Oklared part-----	Moderate: floods, wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Norwood part-----	Moderate: floods.	Slight----------	Slight----------	Slight----------	Severe: low strength, floods.	Moderate: floods.
53---------- Padina	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: droughty.
54.* Pits						
55---------- Rehburg	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
56---------- Renish	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, low strength.	Severe: depth to rock.
57---------- Renish	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, low strength.	Severe: depth to rock.
58:* Renish part------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, low strength.	Severe: depth to rock.
Rock outcrop part.						

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name.	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
59---- Shalba	Severe: wetness, depth to rock.	Severe: wetness, shrink-swell.	Severe: wetness, depth to rock, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness, thin layer.
60:* Shalba part------	Severe: wetness, depth to rock.	Severe: wetness, shrink-swell.	Severe: wetness, depth to rock, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness, thin layer.
Rock outcrop part.						
61---- Silawa	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
62---- Silawa	Slight---------	Slight---------	Slight---------	Moderate: slope.	Slight---------	Slight.
63---- Sumpf	Severe: too clayey, wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, low strength, floods.	Severe: wetness, floods, too clayey.
64---- Tabor	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
65---- Tabor	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: small stones.
66---- Tremona	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
67---- Tremona	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness, slope.	Moderate: wetness.	Moderate: wetness, droughty.
68---- Trinity	Severe: cutbanks cave, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, floods.	Severe: wetness, too clayey.
69, 70---- Trinity	Severe: cutbanks cave, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, floods.	Severe: wetness, floods, too clayey.
71, 72---- Wilson	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1---------- Arol	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too clayey.	Severe: depth to rock, wetness.	Poor: area reclaim, too clayey, hard to pack.
2---------- Asa	Moderate: floods, percs slowly.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.
3---------- Axtell	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
4---------- Axtell	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
5---------- Belk	Severe: percs slowly.	Moderate: seepage.	Moderate: floods.	Moderate: floods.	Good.
6, 7---------- Bleiblerville	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
8---------- Bosque	Severe: floods.	Moderate: seepage.	Severe: floods.	Severe: floods.	Fair: too clayey.
9, 10---------- Brazoria	Severe: wetness, percs slowly.	Severe: floods, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
11---------- Brenham	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
12---------- Burleson	Severe: percs slowly.	Slight----------	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
13---------- Burleson	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
14---------- Burlewash	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
15---------- Burlewash	Severe: percs slowly, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
16:* Burlewash part-----	Severe: percs slowly, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Gullied land part.					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
17:*					
Burlewash part	Severe: percs slowly, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Koether part	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, seepage, slope.
18, 19, 20---------- Carbengle	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Fair: area reclaim.
21, 22---------- Chazos	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
23, 24---------- Clemville	Severe: percs slowly.	Severe: floods.	Severe: too clayey.	Moderate: floods.	Poor: too clayey, hard to pack.
25---------- Crockett	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
26---------- Crockett	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
27, 28, 29---------- Cuero	Slight----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
30---------- Falba	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too clayey.	Severe: depth to rock, wetness.	Poor: area reclaim, too clayey, hard to pack.
31, 32, 33---------- Frelsburg	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
34---------- Gowen	Severe: floods.	Moderate: seepage.	Severe: floods.	Severe: floods.	Fair: too clayey.
35, 36---------- Greenvine	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: too clayey, area reclaim.
37---------- Kaufman	Severe: floods, wetness, percs slowly.	Slight----------	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, hard to pack, wetness.
38:*					
Kiomatia part	Severe: floods, wetness.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: too sandy.
Norwood part	Severe: floods.	Moderate: seepage.	Severe: floods.	Severe: floods.	Fair: too clayey.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
39, 40, 41---------- Klump	Slight----------	Moderate: seepage.	Severe: seepage.	Slight----------	Good.
42---------- Knolle	Slight----------	Severe: seepage.	Severe: seepage.	Slight----------	Good.
43, 44---------- Latium	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
45---------- Latium	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
46---------- Lufkin	Severe: wetness, percs slowly.	Slight----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
47, 48---------- Mabank	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
49---------- Nahatche	Severe: floods, wetness.	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
50---------- Norwood	Moderate: floods, percs slowly.	Moderate: seepage.	Moderate: floods, too clayey.	Moderate: floods.	Fair: too clayey.
51---------- Oklared	Severe: wetness, poor filter.	Severe: seepage, wetness, floods.	Severe: seepage, wetness.	Severe: seepage, wetness.	Good.
52:* Oklared part-------	Severe: wetness, floods, poor filter.	Severe: wetness, seepage, floods.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Good.
Norwood part-------	Severe: floods.	Moderate: seepage.	Severe: floods.	Severe: floods.	Fair: too clayey.
53---------- Padina	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Poor: seepage.
54.* Pits					
55---------- Rehburg	Severe: percs slowly, wetness.	Severe: seepage.	Severe: depth to rock, wetness.	Severe: seepage.	Poor: too clayey.
56---------- Renish	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: poor filter.	Poor: area reclaim.
57---------- Renish	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: poor filter.	Poor: area reclaim.
58:* Renish part--------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: poor filter.	Poor: area reclaim.
Rock outcrop part.					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
59---------- Shalba	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock.	Severe: depth to rock, wetness.	Severe: wetness, depth to rock.	Poor: area reclaim, wetness, too clayey.
60:* Shalba part--------	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock.	Severe: depth to rock, wetness.	Severe: wetness, depth to rock.	Poor: area reclaim, wetness, too clayey.
Rock outcrop part.					
61, 62---------- Silawa	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
63---------- Sumpf	Severe: floods, wetness, percs slowly.	Severe: floods.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, wetness.
64, 65---------- Tabor	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight----------	Poor: too clayey, hard to pack.
66, 67---------- Tremona	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: wetness, too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
68, 69, 70---------- Trinity	Severe: floods, wetness, percs slowly.	Slight----------	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, hard to pack, wetness.
71---------- Wilson	Severe: wetness, percs slowly.	Slight----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
72---------- Wilson	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1---------- Arol	Poor: area reclaim, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
2---------- Asa	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
3, 4---------- Axtell	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
5---------- Belk	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
6, 7---------- Bleiblerville	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
8---------- Bosque	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
9, 10---------- Brazoria	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
11---------- Brenham	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
12, 13---------- Burleson	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
14, 15---------- Burlewash	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
16:* Burlewash part------- Gullied land part.	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
17:* Burlewash part------- Koether part---------	Poor: area reclaim, low strength, shrink-swell. Poor: large stones, slope, thin layer.	Improbable: excess fines. Improbable: thin layer, large stones.	Improbable: excess fines. Improbable: thin layer, large stones.	Poor: too clayey. Poor: area reclaim, slope, large stones.
18, 19, 20---------- Carbengle	Poor: low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey.
21, 22---------- Chazos	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
23, 24---------- Clemville	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
25, 26---------- Crockett	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
27, 28, 29---------- Cuero	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
30---------- Falba	Poor: area reclaim, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
31, 32, 33---------- Frelsburg	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
34---------- Gowen	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
35, 36---------- Greenvine	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
37---------- Kaufman	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
38:*				
Kiomatia part--------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Norwood part---------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
39, 40, 41---------- Klump	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
42---------- Knolle	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
43, 44, 45---------- Latium	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
46---------- Lufkin	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
47, 48---------- Mabank	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
49---------- Nahatche	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
50---------- Norwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
51---------- Oklared	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
52:*				
Oklared part	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Norwood part	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
53--- Padina	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy.
54.* Pits				
55--- Rehburg	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
56--- Renish	Poor: low strength, thin layer, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, area reclaim.
57--- Renish	Poor: low strength, thin layer, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layers, area reclaim.
58:*				
Renish part	Poor: low strength, thin layer, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, area reclaim.
Rock outcrop part.				
59--- Shalba	Poor: low strength, thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, area reclaim, wetness.
60:*				
Shalba part	Poor: low strength, thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, area reclaim, wetness.
Rock outcrop part.				
61, 62--- Silawa	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
63--- Sumpf	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
64--- Tabor	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
65--- Tabor	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, too clayey.
66, 67--- Tremona	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
68, 69, 70---------- Trinity	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
71, 72---------- Wilson	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1---------- Arol	Moderate: depth to rock.	Severe: hard to pack, wetness.	Percs slowly, depth to rock.	Wetness, percs slowly, depth to rock.	Depth to rock, erodes easily, wetness.	Wetness, erodes easily, depth to rock.
2---------- Asa	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Erodes easily	Erodes easily.
3---------- Axtell	Moderate: slope.	Severe: hard to pack.	Not needed-----	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
4---------- Axtell	Severe: slope.	Severe: hard to pack.	Not needed-----	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
5---------- Belk	Moderate: seepage.	Severe: piping.	Not needed-----	Slow intake, percs slowly.	Favorable------	Percs slowly.
6, 7---------- Bleiblerville	Slight---------	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
8---------- Bosque	Moderate: seepage.	Moderate: piping.	Not needed-----	Floods---------	Favorable------	Favorable.
9, 10---------- Brazoria	Slight---------	Severe: hard to pack, wetness.	Percs slowly	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
11---------- Brenham	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Slope----------	Favorable------	Favorable.
12, 13---------- Burleson	Slight---------	Severe: hard to pack.	Not needed-----	Slow intake, percs slowly.	Percs slowly	Percs slowly.
14---------- Burlewash	Moderate: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, erodes easily.	Depth to rock, erodes easily, percs slowly.	Erodes easily, depth to rock, percs slowly.
15---------- Burlewash	Severe: slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
16:* Burlewash part--- Gullied land part.	Severe: slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
17:* Burlewash part--- Koether part-----	Severe: slope. Severe: depth to rock, seepage, slope.	Severe: thin layer. Severe: large stones, seepage, thin layer.	Deep to water Not needed-----	Percs slowly, depth to rock, erodes easily. Depth to rock, large stones, slope.	Slope, depth to rock, erodes easily. Depth to rock, slope, large stones.	Slope, erodes easily, depth to rock. Large stones, depth to rock, slope.
18, 19, 20------- Carbengle	Moderate: depth to rock.	Moderate: thin layer.	Not needed-----	Depth to rock, slope.	Depth to rock	Depth to rock.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
21---------- Chazos	Moderate: slope.	Moderate: hard to pack.	Not needed----	Fast intake, soil blowing, percs slowly.	Soil blowing, percs slowly.	Percs slowly.
22---------- Chazos	Moderate: slope.	Moderate: hard to pack.	Not needed-----	Fast intake, soil blowing, percs slowly.	Soil blowing, percs slowly.	Percs slowly.
23, 24---------- Clemville	Slight---------	Moderate: hard to pack.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
25, 26---------- Crockett	Moderate: slope.	Moderate: piping, hard to pack.	Not needed-----	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
27---------- Cuero	Moderate: seepage.	Moderate: piping.	Not needed-----	Favorable------	Favorable------	Favorable.
28, 29---------- Cuero	Moderate: seepage, slope.	Moderate: piping.	Not needed-----	Slope----------	Favorable------	Favorable.
30---------- Falba	Moderate: depth to rock, slope.	Severe: hard to pack, wetness.	Percs slowly, depth to rock. slope.	Wetness, percs slowly, depth to rock.	Depth to rock, erodes easily, wetness.	Wetness, erodes easily, depth to rock.
31, 32---------- Frelsburg	Slight---------	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
33---------- Frelsburg	Slight---------	Moderate: hard to pack.	Deep to water	Slow intake, slope, percs slowly.	Percs slowly	Percs slowly.
34---------- Gowen	Moderate: seepage.	Moderate: piping.	Not needed-----	Floods---------	Favorable------	Favorable.
35, 36---------- Greenvine	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slow intake, depth to rock.	Percs slowly, depth to rock.	Percs slowly, depth to rock.
37---------- Kaufman	Slight---------	Severe: hard to pack, wetness.	Percs slowly, floods.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
38:* Kiomatia part----	Severe: seepage.	Severe: seepage, piping.	Deep to water	Floods, droughty.	Too sandy------	Droughty.
Norwood part-----	Moderate: seepage.	Severe: piping.	Not needed-----	Erodes easily	Erodes easily	Erodes easily.
39, 40, 41------- Klump	Severe: seepage.	Slight---------	Not needed-----	Fast intake----	Favorable------	Favorable.
42---------- Knolle	Severe: seepage.	Slight---------	Not needed-----	Fast intake, slope.	Favorable------	Favorable.
43---------- Latium	Slight---------	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly.	Percs slowly	Percs slowly.
44---------- Latium	Severe: slope.	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly, slope.	Percs slowly	Percs slowly.
45---------- Latium	Severe: slope.	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly, slope.	Percs slowly	Percs slowly, slope.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
46---------- Lufkin	Slight---------	Severe: hard to pack, wetness.	Percs slowly	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
47, 48---------- Mabank	Slight---------	Severe: wetness.	Percs slowly	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
49---------- Nahatche	Moderate: seepage.	Severe: wetness.	Floods---------	Wetness, floods.	Wetness--------	Wetness.
50---------- Norwood	Moderate: seepage.	Severe: piping.	Not needed-----	Erodes easily	Erodes easily	Erodes easily.
51---------- Oklared	Severe: seepage.	Moderate: seepage, piping.	Favorable------	Favorable------	Favorable------	Favorable.
52:*						
Oklared part-----	Severe: seepage.	Moderate: seepage, piping.	Floods---------	Floods---------	Favorable------	Favorable.
Norwood part-----	Moderate: seepage.	Severe: piping.	Not needed-----	Favorable------	Erodes easily	Erodes easily.
53---------- Padina	Severe: seepage.	Severe: seepage, piping.	Not needed-----	Droughty, fast intake, soil blowing.	Soil blowing	Droughty.
54.* Pits						
55---------- Rehburg	Moderate: depth to rock.	Severe: hard to pack, wetness.	Percs slowly, slope.	Fast intake, percs slowly, wetness.	Wetness, percs slowly.	Percs slowly.
56, 57---------- Renish	Severe: depth to rock.	Severe: thin layer.	Not needed-----	Rooting depth, slope.	Depth to rock	Droughty, rooting depth.
58:*						
Renish part------	Severe: depth to rock.	Severe: thin layer.	Not needed-----	Rooting depth, slope.	Depth to rock	Droughty, rooting depth.
Rock outcrop part.						
59---------- Shalba	Severe: depth to rock.	Severe: thin layer, wetness, hard to pack.	Percs slowly, depth to rock.	Percs slowly, erodes easily, depth to rock.	Percs slowly, erodes easily, depth to rock.	Percs slowly, wetness, erodes easily.
60:*						
Shalba part------	Severe: depth to rock.	Severe: thin layer, wetness, hard to pack.	Percs slowly, depth to rock.	Percs slowly, erodes easily, depth to rock.	Percs slowly, erodes easily, depth to rock.	Percs slowly, wetness, erodes easily.
Rock outcrop part.						
61, 62---------- Silawa	Severe: seepage.	Moderate: piping.	Not needed-----	Fast intake, soil blowing, slope.	Soil blowing	Favorable.
63---------- Sumpf	Slight---------	Severe: wetness.	Percs slowly, floods.	Wetness, slow intake, floods.	Wetness, percs slowly.	Wetness, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
64, 65---------- Tabor	Moderate: slope.	Moderate: hard to pack.	Not needed-----	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
66, 67---------- Tremona	Slight---------	Severe: hard to pack.	Percs slowly, slope.	Wetness, droughty, fast intake.	Wetness, soil blowing, percs slowly.	Droughty, percs slowly.
68, 69, 70------- Trinity	Slight---------	Severe: hard to pack, wetness.	Percs slowly, floods.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
71, 72---------- Wilson	Slight---------	Severe: hard to pack, wetness.	Percs slowly	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1---------- Arol	0-8	Fine sandy loam	SM-SC, SM, CL-ML, ML	A-4	0	98-100	95-100	70-98	40-65	<20	NP*-7
	8-32	Clay, clay loam	CH	A-7	0	98-100	95-100	90-100	70-95	51-70	34-48
	32-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
2---------- Asa	0-73	Silt loam, loam	CL, CL-ML	A-6, A-4	0	98-100	98-100	95-100	65-95	25-40	6-21
	73-80	Very fine sandy loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	98-100	98-100	85-95	60-95	20-35	6-20
3---------- Axtell	0-6	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0	90-100	80-100	75-100	28-75	<31	NP-7
	6-46	Clay, clay loam, sandy clay.	CL, CH	A-7-6	0-2	90-100	75-100	75-100	51-98	41-60	25-40
	46-62	Sandy clay loam, clay loam, clay.	CL, CH, SC	A-6, A-7-6	0-2	85-100	75-100	75-100	36-98	35-70	15-45
4---------- Axtell	0-9	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0	90-100	80-100	75-100	28-75	<31	NP-7
	9-50	Clay, clay loam, sandy clay.	CL, CH	A-7-6	0-2	90-100	75-100	75-100	51-98	41-60	25-40
	50-65	Sandy clay loam, clay loam, clay.	CL, CH, SC	A-6, A-7-6	0-2	85-100	75-100	75-100	36-98	35-70	15-45
5---------- Belk	0-25	Clay----------	CL, CH	A-7-6	0	100	100	95-100	85-95	44-66	22-39
	25-62	Stratified silt loam to very fine sandy loam.	ML, CL-ML, CL	A-4	0	100	100	90-100	70-90	<26	NP-8
6---------- Bleiblerville	0-75	Clay----------	CH	A-7-6	0	95-100	95-100	90-100	85-100	55-80	35-65
7---------- Bleiblerville	0-73	Clay----------	CH	A-7-6	0	95-100	95-100	90-100	85-100	55-80	35-65
8---------- Bosque	0-22	Clay loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-95	24-40	7-22
	22-62	Loam, clay loam, clay.	CL, CL-ML	A-4, A-6, A-7-6	0	98-100	95-100	80-100	55-95	24-45	7-25
9, 10---------- Brazoria	0-80	Clay----------	CH	A-7	0	98-100	98-100	95-100	95-100	60-75	35-50
11---------- Brenham	0-10	Clay loam--------	CL, CH	A-7-6	0	100	100	85-100	70-100	41-55	22-35
	10-48	Silty clay loam, clay loam, clay.	CL, CH	A-7-6, A-6	0	95-100	95-100	85-100	75-100	35-52	20-30
	48-61	Clay, silty clay.	CL, CH	A-7-6	0	95-100	95-100	85-100	80-100	41-55	22-35
12---------- Burleson	0-60	Clay----------	CH	A-7-6, A-7-5	0-2	83-100	80-100	80-100	80-96	51-90	27-55
	60-70	Clay, silty clay	CH	A-7-6, A-7-5	0-1	95-100	80-100	75-99	70-95	51-90	30-55
13---------- Burleson	0-46	Clay----------	CH	A-7-6, A-7-5	0-2	83-100	80-100	80-100	80-96	51-90	27-55
	46-80	Clay, silty clay	CH	A-7-6, A-7-5	0-1	95-100	80-100	75-99	70-95	51-90	30-55
14---------- Burlewash	0-6	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	90-100	90-100	70-95	40-60	<20	NP-7
	6-21	Clay, sandy clay	CL, CH	A-7	0	95-100	95-100	90-100	51-90	41-55	20-30
	21-27	Clay loam, sandy clay loam, clay.	CL	A-6, A-7	0	95-100	95-100	75-100	51-75	35-45	18-25
	27-40	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnotes at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
15---------- Burlewash	0-8	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	90-100	90-100	70-95	40-60	<20	NP-7
	8-28	Clay, sandy clay	CL, CH	A-7	0	95-100	95-100	90-100	51-90	41-55	20-30
	28-38	Weathered bedrock.	---	---	---	---	---	---	---	---	---
16:**											
Burlewash part--	0-3	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	90-100	90-100	70-95	40-60	<20	NP-7
	3-33	Clay, sandy clay	CL, CH	A-7	0	95-100	95-100	90-100	51-90	41-55	20-30
	33-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Gullied land part.											
17:**											
Burlewash part--	0-8	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	90-100	90-100	70-95	40-60	<20	NP-7
	8-23	Clay, sandy clay	CL, CH	A-7	0	95-100	95-100	90-100	51-90	41-55	20-30
	23-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
Koether part----	0-16	Stony loamy sand	SM, SP-SM	A-2	35-70	80-98	80-98	75-90	10-30	<20	NP-4
	16-17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
18---------- Carbengle	0-12	Clay loam--------	CL	A-6, A-4	0-5	90-98	85-100	70-98	51-80	25-40	8-20
	12-29	Loam, clay loam, silty clay loam.	CL, SC	A-6, A-4	0-8	85-100	80-100	70-98	36-85	25-40	8-20
	29-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
19---------- Carbengle	0-12	Clay loam--------	CL	A-6, A-4	0-5	90-98	85-100	70-98	51-80	25-40	8-20
	12-34	Loam, clay loam, silty clay loam.	CL, SC	A-6, A-4	0-8	85-100	80-100	70-98	36-85	25-40	8-20
	34-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
20---------- Carbengle	0-12	Clay loam--------	CL	A-6, A-4	0-5	90-98	85-100	70-98	51-80	25-40	8-20
	12-36	Loam, clay loam, silty clay loam.	CL, SC	A-6, A-4	0-8	85-100	80-100	70-98	36-85	25-40	8-20
	36-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
21---------- Chazos	0-12	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	80-100	80-100	60-98	20-50	<25	NP-4
	12-21	Clay, sandy clay	CL, CH	A-7-6	0	90-100	90-100	90-100	55-85	43-58	21-35
	21-80	Clay, sandy clay, sandy clay loam.	CL, CH	A-7-6, A-6	0	90-100	90-100	80-100	50-80	35-55	15-35
22---------- Chazos	0-11	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	80-100	80-100	60-98	20-50	<25	NP-4
	11-33	Clay, sandy clay	CL, CH	A-7-6	0	90-100	90-100	90-100	55-85	43-58	21-35
	33-65	Clay, sandy clay, sandy clay loam.	CL, CH	A-7-6, A-6	0	90-100	90-100	80-100	50-80	35-55	15-35
23---------- Clemville	0-15	Silt loam--------	CL, CL-ML	A-6, A-4	0	98-100	98-100	95-100	70-95	25-40	6-21
	15-80	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0	98-100	98-100	95-100	85-100	40-55	15-33
24---------- Clemville	0-28	Silt loam--------	CL, CL-ML	A-6, A-4	0	98-100	98-100	95-100	70-97	25-40	6-21
	28-75	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0	98-100	98-100	95-100	85-100	40-55	15-33
25---------- Crockett	0-7	Fine sandy loam	SM, ML, CL, SC	A-4, A-6	0-2	95-100	95-100	90-100	35-98	15-35	3-15
	7-14	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	85-100	80-100	75-100	65-98	36-60	22-45
	14-80	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	85-100	80-100	75-100	51-98	36-60	18-42

See footnotes at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
26---------- Crockett	0-8	Fine sandy loam	SM, ML, CL, SC	A-4, A-6	0-2	95-100	95-100	90-100	35-98	15-35	3-15
	8-30	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	85-100	80-100	75-100	65-98	36-60	22-45
	30-60	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	85-100	80-100	75-100	51-98	36-60	18-42
27---------- Cuero	0-14	Sandy clay loam, clay loam.	CL, SC	A-4, A-6, A-2-4, A-2-6	0	95-100	95-100	70-95	30-70	25-35	8-15
	14-35	Sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	95-100	95-100	80-100	40-80	30-44	11-22
	35-47	Sandy clay loam, clay loam.	CL, SC	A-6	0	85-100	85-100	80-90	36-55	30-40	11-20
	47-58	Variable----------	---	---	---	---	---	---	---	---	---
28---------- Cuero	0-21	Sandy clay loam	CL, SC	A-4, A-6, A-2-4, A-2-6	0	95-100	95-100	70-95	30-70	25-35	8-15
	21-54	Sandy clay loam, clay loam, sandy clay.	CL, SC	A-6, A-7	0	95-100	95-100	80-100	40-80	30-44	11-22
	54-80	Sandy clay loam, clay loam, sandy clay.	CL, SC	A-6	0	85-100	85-100	80-90	36-55	30-40	11-20
29---------- Cuero	0-18	Sandy clay loam	CL, SC	A-4, A-6, A-2-4, A-2-6	0	95-100	95-100	70-95	30-70	25-35	8-15
	18-48	Sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	95-100	95-100	80-100	40-80	30-44	11-22
	48-60	Sandy clay loam, clay loam.	CL, SC	A-6	0	85-100	85-100	80-90	36-55	30-40	11-20
	60-70	Variable----------	---	---	---	---	---	---	---	---	---
30---------- Falba	0-4	Fine sandy loam	SM-SC, SM, CL-ML, ML	A-4	0	98-100	95-100	70-98	40-60	<20	NP-7
	4-24	Clay, clay loam	CH	A-7	0	98-100	95-100	90-100	75-95	51-70	34-48
	24-45	Weathered bedrock.	---	---	---	---	---	---	---	---	---
31---------- Frelsburg	0-75	Clay----------	CH	A-7-6	0	95-100	95-100	70-100	85-100	55-80	35-65
32---------- Frelsburg	0-57	Clay----------	CH	A-7-6	0	95-100	95-100	70-100	85-100	55-80	35-65
33---------- Frelsburg	0-65	Clay----------	CH	A-7-6	0	95-100	95-100	70-100	85-100	55-80	35-65
34---------- Gowen	0-24	Clay loam--------	CL	A-6, A-7-6	0	100	95-100	85-100	60-85	28-43	11-25
	24-60	Clay loam, loam, sandy clay loam.	CL	A-6, A-7-6	0	100	95-100	85-100	55-85	25-43	10-25
35---------- Greenvine	0-31	Clay----------	CH	A-7-6	0	100	100	90-100	75-98	55-75	32-50
	31-50	Weathered bedrock.	---	---	---	---	---	---	---	---	---
36---------- Greenvine	0-29	Clay----------	CH	A-7-6	0	100	100	90-100	75-98	55-75	32-50
	29-50	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnotes at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
37----------	0-8	Clay----------	CH	A-7	0	100	100	90-100	80-95	56-75	33-49
Kaufman	8-60	Clay----------	CH	A-7	0	100	100	95-100	90-100	65-96	45-70
38:*											
Kiomatia part---	0-4	Loamy fine sand	SM, SM-SC	A-4, A-2-4	0	100	95-100	80-100	30-45	<26	NP-7
	4-60	Stratified fine sand to loam.	SM, SM-SC	A-2-4	0	100	95-100	80-90	13-30	<22	NP-5
Norwood part----	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	70-90	20-35	4-15
	13-37	Silt loam, silty clay loam, loam. fine sandy loam, silty clay loam.	CL CL-ML	A-6, A-7 A-7	0	100	100	90-100	70-98	30-46	11-26
39----------	0-15	Loamy sand-------	SM	A-2	0	100	100	50-75	15-30	<30	NP-3
Klump	15-62	Sandy clay loam, clay loam.	SC, CL	A-4, A-6, A-2	0	100	100	80-100	30-65	23-38	7-15
40----------	0-11	Loamy sand-------	SM	A-2	0	100	100	50-75	15-30	<30	NP-3
Klump	11-45	Sandy clay loam, clay loam.	SC, CL	A-4, A-6, A-2	0	100	100	80-100	30-65	23-38	7-15
	45-60	Sandy clay loam, fine sandy loam, sandy loam, loamy sand.	SM, SC, SP-SM	A-2	0	100	100	75-100	5-30	20-27	3-7
41----------	0-13	Loamy sand-------	SM	A-2	0	100	100	50-75	15-30	<30	NP-3
Klump	13-56	Sandy clay loam, clay loam.	SC, CL	A-4, A-6, A-2	0	100	100	80-100	30-65	23-38	7-15
	56-64	Sandy clay loam, fine sandy loam, sandy loam.	SM, SC	A-2	0	100	100	75-100	15-30	20-27	3-7
42----------	0-8	Coarse sand------	SM, SP-SM	A-2-4	0	100	98-100	80-100	5-25	<21	NP-5
Knolle	8-12	Sandy loam, loamy coarse sand, loamy sand.	SM	A-2-4, A-4	0	100	98-100	80-100	25-45	20-27	5-9
	12-46	Sandy clay loam, clay loam.	SC, CL	A-6, A-4	0	100	98-100	85-100	36-65	25-39	7-17
	46-65	Sandy loam, sandy clay loam, loamy sand.	SM, SC	A-2, A-4, A-6	0	100	98-100	85-100	23-45	20-28	3-10
43----------	0-80	Clay----------	CH	A-7-6	0	95-100	90-100	85-100	80-100	55-80	35-65
Latium											
44----------	0-70	Clay----------	CH	A-7-6	0	95-100	90-100	85-100	80-100	55-80	35-65
Latium											
45----------	0-65	Clay----------	CH	A-7-6	0	95-100	90-100	85-100	80-100	55-80	35-65
Latium											
46----------	0-8	Fine sandy loam	SM, CL, ML, SC	A-4	0-5	90-100	80-100	80-100	40-85	<30	NP-10
Lufkin	8-35	Clay, clay loam, silty clay loam.	CH, CL	A-7-6	0	90-100	90-100	90-100	65-95	45-67	30-45
	35-80	Clay, clay loam, sandy clay loam.	CH, CL, SC	A-7, A-6	0	70-100	70-100	55-100	44-90	40-86	25-55
47----------	0-8	Fine sandy loam	CL, ML, SM, SC	A-4	0	95-100	95-100	80-98	40-70	<30	NP-10
Mabank	8-62	Clay, clay loam	CH, CL	A-7, A-6	0	95-100	95-100	95-100	60-85	35-65	20-40
48----------	0-5	Fine sandy loam	CL, ML, SM, SC	A-4	0	95-100	95-100	80-98	40-70	<30	NP-10
Mabank	5-60	Clay, clay loam	CH, CL	A-7, A-6	0	95-100	95-100	95-100	60-85	35-65	20-40

See footnotes at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
49---------- Nahatche	0-24	Clay loam--------	CL	A-6, A-7, A-4	0	100	100	90-100	51-80	25-45	8-25
	24-60	Stratified loam to silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-80	30-45	11-25
50---------- Norwood	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	70-90	20-35	4-15
	8-60	Silt loam, very fine sandy loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	90-100	70-98	20-45	2-25
51---------- Oklared	0-8	Very fine sandy loam.	CL, ML, CL-ML	A-4	0	100	100	94-100	51-85	<30	NP-10
	8-60	Fine sandy loam, very fine sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	98-100	94-100	36-85	<30	NP-10
52:**											
Oklared part----	0-6	Very fine sandy loam.	CL, ML, CL-ML	A-4	0	100	100	94-100	51-85	<30	NP-10
	6-65	Fine sandy loam, very fine sandy loam, loamy fine sand.	SM, SC, ML, CL	A-2, A-4	0	100	98-100	90-100	15-60	<30	NP-10
Norwood part----	0-11	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-98	30-55	15-35
	11-60	Silt loam, very fine sandy loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	100	100	90-100	70-98	20-45	2-25
53---------- Padina	0-60	Loamy fine sand	SM, SP-SM, SM-SC	A-2-4, A-3	0	100	95-100	85-100	8-28	<25	NP-5
	60-80	Sandy clay loam, fine sandy loam.	SC	A-2, A-4, A-6	0	90-100	90-100	90-100	25-50	22-36	8-20
54.* Pits											
55---------- Rehburg	0-23	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	95-100	95-100	60-95	15-40	<25	NP-4
	23-36	Clay, sandy clay, clay loam.	CH, CL, SC	A-7-6, A-6	0	95-100	95-100	80-100	40-95	43-66	21-39
	36-44	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7-6	0	95-100	95-100	80-100	35-80	36-50	17-30
	44-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
56---------- Renish	0-12	Clay loam--------	CL	A-6, A-4	0-10	85-100	80-100	80-100	65-90	30-40	9-18
	12-13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
57---------- Renish	0-12	Clay loam.	CL	A-6, A-4	0-10	85-100	80-100	80-100	65-90	30-40	9-18
	12-15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
58:**											
Renish part-----	0-15	Clay loam--------	CL	A-6, A-4	0-10	85-100	80-100	80-100	65-90	30-40	9-18
	15-18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
59---------- Shalba	0-4	Fine sandy loam	SM-SC, SM, CL-ML, ML	A-4	0	95-100	95-100	70-98	40-60	<20	NP-7
	4-18	Clay-------------	CH	A-7	0	95-100	95-100	90-100	75-95	51-70	34-48
	18-40	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnotes at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
60:**											
Shalba part-----	0-2	Fine sandy loam	SM-SC, SM, CL-ML, ML	A-4	0	95-100	95-100	70-98	40-60	<20	NP-7
	2-18	Clay----------	CH	A-7	0	95-100	95-100	90-100	75-95	51-70	34-48
	18-40	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
61----------	0-11	Loamy fine sand	SM, SM-SC	A-2-4	0	80-100	80-100	70-100	15-35	<25	NP-4
Silawa	11-45	Sandy clay loam, fine sandy loam.	CL, SC	A-4, A-6	0	80-100	80-100	80-100	35-60	25-40	8-18
	45-60	Loamy fine sand, gravelly loamy sand, fine sandy loam.	SM, SM-SC, SP-SM, GM	A-2-4, A-4, A-1-B	0-2	51-100	51-100	38-100	12-40	<26	NP-7
62----------	0-12	Loamy fine sand	SM, SM-SC	A-2-4	0	80-100	80-100	70-100	15-35	<25	NP-4
Silawa	12-50	Sandy clay loam, fine sandy loam.	CL, SC	A-4, A-6	0	80-100	80-100	80-100	35-60	25-40	8-18
	50-62	Loamy fine sand, gravelly loamy sand, fine sandy loam.	SM, SM-SC, SP-SM, GM	A-2-4, A-4, A-1-B	0-2	51-100	51-100	38-100	12-40	<26	NP-7
63----------	0-60	Clay----------	CH	A-7	0	98-100	98-100	95-100	95-100	55-80	35-55
Sumpf	60-75	Clay----------	CH, CL, ML, SM	A-7, A-6, A-4	0	98-100	98-100	70-100	40-100	18-80	4-55
64----------	0-13	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4, A-2-4	0	85-100	75-100	70-100	30-55	<25	NP-7
Tabor	13-52	Clay----------	CH, CL	A-7	0	95-100	90-100	85-100	55-90	45-65	25-40
	52-80	Clay, clay loam, sandy clay loam.	CH, CL, SC	A-7, A-6	0	95-100	90-100	75-100	40-90	35-60	15-35
65----------	0-16	Very gravelly fine sandy loam.	GM, SM, SM-SC, SP-SM	A-1, A-3, A-2	0-10	15-80	15-75	12-65	5-25	<20	NP-5
Tabor	16-52	Clay----------	CH, CL	A-7	0	95-100	90-100	85-100	55-90	45-65	25-40
66----------	0-28	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0	80-100	80-100	60-100	8-35	<25	NP-3
Tremona	28-63	Sandy clay, sandy clay loam, clay.	SC, CL, CH	A-7	0	80-100	80-100	75-100	36-85	40-60	20-40
	63-80	Sandy clay loam, sandy clay.	SC, CL, CH	A-7, A-6, A-2-7, A-2-6	0	80-100	80-100	70-100	30-85	30-60	15-40
67----------	0-22	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0	80-100	80-100	60-100	8-35	<25	NP-3
Tremona	22-45	Sandy clay, clay	SC, CL, CH	A-7	0	80-100	80-100	75-100	36-85	40-60	20-40
	45-60	Sandy clay loam, sandy clay.	SC, CL, CH	A-7, A-6, A-2-7, A-2-6	0	80-100	80-100	70-100	30-85	30-60	15-40
68----------	0-13	Clay----------	CH	A-7	0	100	98-100	85-100	80-100	55-90	30-60
Trinity											
69----------	0-80	Clay----------	CH	A-7	0	100	98-100	85-100	80-100	55-90	30-60
Trinity											

See footnotes at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
70---------- Trinity	0-34	Clay----------	CH	A-7	0	100	98-100	85-100	80-100	55-90	30-60
71---------- Wilson	0-7	Clay loam--------	CL	A-6	0	95-100	85-100	80-100	60-96	25-36	10-20
	7-42	Silty clay, clay, clay loam.	CL, CH	A-7-6, A-6	0	90-100	80-100	80-100	65-96	38-55	21-35
	42-77	Silty clay, clay, silty clay loam.	CL, CH	A-7-6, A-6	0	95-100	90-100	85-100	70-96	38-65	24-48
72---------- Wilson	0-4	Clay loam--------	CL	A-6	0	95-100	85-100	80-100	60-96	25-36	10-20
	4-41	Silty clay, clay, clay loam.	CL, CH	A-7-6, A-6	0	90-100	80-100	80-100	65-96	38-55	21-35
	41-60	Silty clay, clay, silty clay loam.	CL, CH	A-7-6, A-6	0	95-100	90-100	85-100	70-96	38-65	24-48

* NP means nonplastic.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than. Entries under "Erosion factors--T" apply to the entire profile. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
							K	T
	In	Pct	In/hr	In/in	pH			
1----------	0-8	15-25	0.6-2.0	0.11-0.17	5.1-6.0	Low----------	0.43	3
Arol	8-32	35-50	<0.06	0.14-0.18	5.1-7.8	High----------	0.32	
	32-40	---	---	---	---	----------	----	
2----------	0-73	18-35	0.6-2.0	0.17-0.22	6.6-8.4	Low----------	0.28	5
Asa	73-80	10-35	0.6-2.0	0.15-0.22	7.9-8.4	Low----------	0.43	
3----------	0-6	7-18	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.43	5
Axtell	6-46	40-55	<0.06	0.13-0.18	4.5-5.5	High----------	0.37	
	46-62	25-50	0.2-0.6	0.13-0.18	5.6-8.4	High----------	0.37	
4----------	0-9	7-18	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.43	5
Axtell	9-50	40-55	<0.06	0.13-0.18	4.5-5.5	High----------	0.37	
	50-65	25-50	0.2-0.6	0.13-0.18	5.6-8.4	High----------	0.37	
5----------	0-25	40-60	<0.06	0.12-0.18	7.9-8.4	High----------	0.32	5
Belk	25-62	15-35	0.6-2.0	0.16-0.24	7.9-8.4	Low----------	0.28	
6----------	0-75	45-60	<0.06	0.15-0.18	7.4-8.4	Very high----	0.32	5
Bleiblerville								
7----------	0-73	45-60	<0.06	0.15-0.18	7.4-8.4	Very high----	0.32	5
Bleiblerville								
8----------	0-22	20-35	0.6-2.0	0.15-0.20	7.4-8.4	Low----------	0.28	5
Bosque	22-62	20-45	0.6-2.0	0.11-0.18	7.9-8.4	Low----------	0.28	
9, 10----------	0-80	60-80	<0.06	0.14-0.19	7.4-8.4	High----------	0.32	5
Brazoria								
11----------	0-10	25-35	0.6-2.0	0.15-0.20	7.9-8.4	Moderate-----	0.32	5
Brenham	10-48	36-44	0.6-2.0	0.15-0.20	7.9-8.4	Moderate-----	0.32	
	48-61	36-55	0.6-2.0	0.15-0.20	7.9-8.4	Moderate-----	0.32	
12----------	0-60	35-60	<0.06	0.12-0.18	5.6-8.4	High----------	0.32	5
Burleson	60-70	35-60	<0.06	0.12-0.18	7.4-8.4	High----------	0.32	
13----------	0-46	35-60	<0.06	0.12-0.18	5.6-8.4	High----------	0.32	5
Burleson	46-80	35-60	<0.06	0.12-0.18	7.4-8.4	High----------	0.32	
14----------	0-6	5-15	0.6-2.0	0.11-0.15	4.5-6.0	Low----------	0.43	2
Burlewash	6-21	40-50	<0.06	0.12-0.18	3.6-5.5	High----------	----	
	21-27	30-45	0.2-0.6	0.12-0.18	4.5-5.5	High----------	----	
	27-40	---	---	---	---	----------	----	
15----------	0-8	5-15	0.6-2.0	0.11-0.15	4.5-6.0	Low----------	0.43	2
Burlewash	8-28	40-50	<0.06	0.12-0.18	3.6-5.5	High----------	----	
	28-40	---	---	---	---	----------	----	
16:*								
Burlewash part--	0-3	5-15	0.6-2.0	0.11-0.15	4.5-6.0	Low----------	0.43	2
	3-33	40-50	<0.06	0.12-0.18	3.6-5.5	High----------	----	
	33-60	---	---	---	---	----------	----	
Gullied land part.								
17:*								
Burlewash part--	0-8	5-15	0.6-2.0	0.11-0.15	4.5-6.0	Low----------	0.43	2
	8-23	40-50	<0.06	0.12-0.18	3.6-5.5	High----------	----	
	23-40	---	---	---	---	----------	----	
Koether part-----	0-16	5-10	6.0-20	0.03-0.08	4.5-5.5	Low----------	0.15	1
	16-17	---	---	---	---	----------	----	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Map symbol and soil name	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
							K	T
	In	Pct	In/hr	In/in	pH			
18---------- Carbengle	0-12	25-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32	3
	12-29	25-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32	
	29-60	---	---	---	---	----------	----	
19---------- Carbengle	0-12	25-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32	3
	12-34	25-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32	
	34-60	---	---	---	---	----------	----	
20---------- Carbengle	0-12	25-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32	3
	12-36	25-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32	
	36-60	---	---	---	---	----------	----	
21---------- Chazos	0-12	5-12	2.0-6.0	0.06-0.10	5.6-7.3	Very low-----	0.20	5
	12-21	35-50	0.06-0.2	0.15-0.18	5.1-6.5	Moderate-----	0.32	
	21-80	25-45	0.06-0.2	0.15-0.18	5.6-8.4	Moderate-----	0.28	
22---------- Chazos	0-11	5-12	2.0-6.0	0.06-0.10	5.6-7.3	Very low-----	0.20	5
	11-33	35-50	0.06-0.2	0.15-0.18	5.1-6.5	Moderate-----	0.32	
	33-65	25-45	0.06-0.2	0.15-0.18	5.6-8.4	Moderate-----	0.28	
23---------- Clemville	0-15	15-25	0.2-0.6	0.17-0.22	7.9-8.4	Low----------	0.43	5
	15-80	35-50	0.06-0.2	0.14-0.20	6.6-8.4	High---------	0.37	
24---------- Clemville	0-28	15-25	0.2-0.6	0.17-0.22	7.9-8.4	Low----------	0.43	5
	28-75	35-50	0.06-0.2	0.14-0.20	6.6-8.4	High---------	0.37	
25---------- Crockett	0-7	5-20	0.6-2.0	0.11-0.20	5.6-7.3	Low----------	0.43	5
	7-14	40-60	<0.06	0.14-0.18	5.6-7.3	High---------	0.32	
	14-80	40-60	<0.06	0.14-0.18	6.1-8.4	High---------	0.32	
26---------- Crockett	0-8	5-20	0.6-2.0	0.11-0.20	5.6-7.3	Low----------	0.43	5
	8-30	40-60	<0.06	0.14-0.18	5.6-7.3	High---------	0.32	
	30-60	40-60	<0.06	0.14-0.18	6.1-8.4	High---------	0.32	
27---------- Cuero	0-14	15-30	0.6-2.0	0.11-0.19	6.6-7.8	Low----------	0.24	4
	14-35	20-35	0.6-2.0	0.15-0.22	6.6-8.4	Moderate-----	0.28	
	35-47	20-35	0.6-2.0	0.15-0.19	7.9-8.4	Moderate-----	0.32	
	47-58	---	---	---	---	----------	----	
28---------- Cuero	0-21	15-30	0.6-2.0	0.11-0.19	6.6-7.8	Low----------	0.24	4
	21-54	20-35	0.6-2.0	0.15-0.22	6.6-8.4	Moderate-----	0.28	
	54-80	20-35	0.6-2.0	0.15-0.19	7.9-8.4	Moderate-----	0.32	
29---------- Cuero	0-18	15-30	0.6-2.0	0.11-0.19	6.6-7.8	Low----------	0.24	4
	18-48	20-35	0.6-2.0	0.15-0.22	6.6-8.4	Moderate-----	0.28	
	48-60	20-35	0.6-2.0	0.15-0.19	7.9-8.4	Moderate-----	0.32	
	60-70	---	---	---	---	----------	----	
30---------- Falba	0-4	10-20	0.6-2.0	0.11-0.15	5.1-6.0	Low----------	0.43	2
	4-24	35-50	<0.06	0.14-0.18	4.5-5.5	High---------	0.32	
	24-45	---	---	---	---	----------	----	
31---------- Frelsburg	0-75	45-60	<0.06	0.15-0.20	7.4-8.4	Very high----	0.32	5
32---------- Frelsburg	0-57	45-60	<0.06	0.15-0.20	7.4-8.4	Very high----	0.32	5
33---------- Frelsburg	0-65	45-60	<0.06	0.15-0.20	7.4-8.4	Very high----	0.32	5

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Map symbol and soil name	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
							K	T
	In	Pct	In/hr	In/in	pH			
34----------	0-24	15-30	0.6-2.0	0.15-0.20	6.6-8.4	Moderate-----	0.28	5
Gowen	24-60	20-35	0.6-2.0	0.15-0.20	6.6-8.4	Moderate-----	0.28	
35----------	0-31	40-60	<0.06	0.12-0.18	6.6-8.4	High---------	0.32	3
Greenvine	31-50	---	---	---	---	----------	----	
36----------	0-29	40-60	<0.06	0.12-0.18	6.6-8.4	High---------	0.32	3
Greenvine	29-50	---	---	---	---	----------	----	
37----------	0-8	40-80	0.06-0.2	0.15-0.20	5.6-8.4	High---------	0.32	5
Kaufman	8-60	60-80	<0.06	0.15-0.18	5.6-8.4	Very high----	0.32	
38:*								
Kiomatia part---	0-4	5-15	0.6-2.0	0.10-0.15	6.1-8.4	Low----------	0.17	5
	4-60	2-15	6.0-20	0.05-0.10	6.1-8.4	Low----------	0.17	
Norwood part----	0-13	10-27	0.6-2.0	0.17-0.21	7.4-8.4	Low----------	0.43	5
	13-37	18-35	0.6-2.0	0.15-0.22	7.9-8.4	Low----------	0.43	
	37-80	10-35	0.6-2.0	0.15-0.22	7.9-8.4	Low----------	0.43	
39----------	0-15	3-10	2.0-6.0	0.08-0.12	5.6-7.8	Low----------	0.17	5
Klump	15-62	20-35	0.6-2.0	0.15-0.20	5.1-7.3	Low----------	0.32	
40----------	0-11	3-10	2.0-6.0	0.08-0.12	5.6-7.8	Low----------	0.17	5
Klump	11-45	20-35	0.6-2.0	0.15-0.20	5.1-7.3	Low----------	0.32	
	45-60	10-25	2.0-6.0	0.10-0.15	5.6-8.4	Low----------	0.32	
41----------	0-13	3-10	2.0-6.0	0.08-0.12	5.6-7.8	Low----------	0.17	5
Klump	13-56	20-35	0.6-2.0	0.15-0.20	5.1-7.3	Low----------	0.32	
	56-64	10-25	2.0-6.0	0.10-0.15	5.6-8.4	Low----------	0.32	
42----------	0-8	3-15	6.0-20.0	0.05-0.10	5.6-7.3	Low----------	0.20	5
Knolle	8-12	10-25	2.0-6.0	0.10-0.14	5.1-7.3	Low----------	0.24	
	12-46	20-35	0.6-2.0	0.12-0.17	5.1-7.3	Low----------	0.32	
	46-65	10-25	2.0-6.0	0.07-0.14	5.1-6.5	Low----------	0.32	
43----------	0-80	45-60	<0.06	0.15-0.18	7.4-8.4	Very high----	0.32	4
Latium								
44----------	0-70	45-60	<0.06	0.15-0.18	7.4-8.4	Very high----	0.32	4
Latium								
45----------	0-65	45-60	<0.06	0.15-0.18	7.4-8.4	Very high----	0.32	4
Latium								
46----------	0-8	15-25	0.6-2.0	0.11-0.18	5.1-6.5	Low----------	0.43	5
Lufkin	8-35	35-50	<0.06	0.12-0.18	4.5-7.8	Very high----	0.32	
	35-80	35-50	<0.06	0.10-0.14	6.1-8.4	High---------	0.37	
47----------	0-8	10-25	0.6-2.0	0.11-0.15	5.6-7.3	Low----------	0.43	5
Mabank	8-62	35-50	<0.06	0.12-0.18	5.6-8.4	High---------	0.32	
48----------	0-5	10-25	0.6-2.0	0.11-0.15	5.6-7.3	Low----------	0.43	5
Mabank	5-60	35-50	<0.06	0.12-0.18	5.6-8.4	High---------	0.32	
49----------	0-24	18-35	0.6-2.0	0.10-0.15	5.1-7.8	Moderate-----	0.28	5
Nahatche	24-60	18-35	0.6-2.0	0.10-0.15	5.1-7.8	Moderate-----	0.28	
50----------	0-8	10-27	0.6-2.0	0.17-0.21	7.4-8.4	Low----------	0.43	5
Norwood	8-60	10-35	0.6-2.0	0.15-0.22	7.9-8.4	Low----------	0.43	
51----------	0-8	10-18	2.0-6.0	0.13-0.20	7.4-8.4	Low----------	0.32	5
Oklared	8-60	10-44	2.0-6.0	0.12-0.16	7.4-8.4	Low----------	0.32	
52:*								
Oklared part----	0-6	10-18	2.0-6.0	0.13-0.20	7.4-8.4	Low----------	0.32	5
	6-65	44-60	2.0-20	0.10-0.16	7.4-8.4	Low----------	0.32	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Map symbol and soil name	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
							K	T
	In	Pct	In/hr	In/in	pH			
52:*								
Norwood part----	0-11	27-40	0.6-2.0	0.18-0.22	7.4-8.4	Moderate-----	0.32	5
	11-60	10-35	0.6-2.0	0.15-0.22	7.9-8.4	Low----------	0.43	
53----------	0-60	2-10	6.0-20	0.05-0.08	5.6-7.3	Very low-----	0.17	5
Padina	60-80	18-35	0.6-2.0	0.14-0.18	5.1-6.5	Low----------	0.24	
54.*								
Pits								
55----------	0-23	2-10	6.0-20.0	0.05-0.10	5.1-7.3	Low----------	0.28	4
Rehburg	23-36	30-50	<0.06	0.10-0.15	4.5-6.5	High---------	0.37	
	36-44	20-35	0.06-0.2	0.10-0.15	4.5-6.5	High---------	0.37	
	44-60	---	---	---	---	----------	----	
56----------	0-12	15-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32	1
Renish	12-13	---	---	---	---	----------	----	
57----------	0-12	15-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32	1
Renish	12-15	---	---	---	---	----------	----	
58:*								
Renish----------	0-15	15-35	0.6-2.0	0.15-0.20	7.9-8.4	Low----------	0.32	1
	15-18	---	---	---	---	----------	----	
Rock outcrop.								
59----------	0-4	5-15	0.6-2.0	0.11-0.15	4.5-6.0	Low----------	0.43	1
Shalba	2-18	40-60	<0.06	0.14-0.18	4.5-6.0	High---------	0.32	
	18-40	---	---	---	---	----------	----	
60:*								
Shalba part-----	0-2	5-15	0.6-2.0	0.11-0.15	4.5-6.0	Low----------	0.43	1
	4-18	40-60	<0.06	0.14-0.18	4.5-6.0	High---------	0.32	
	18-40	---	---	---	---	----------	----	
Rock outcrop part.								
61----------	0-11	5-15	6.0-20	0.07-0.11	5.1-6.5	Very low-----	0.17	5
Silawa	11-45	18-35	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.32	
	45-60	2-15	6.0-20	0.05-0.11	4.5-6.0	Very low-----	0.20	
62----------	0-12	5-15	6.0-20	0.07-0.11	5.1-6.5	Very low-----	0.17	5
Silawa	12-50	18-35	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.32	
	50-62	2-15	6.0-20	0.05-0.11	4.5-6.0	Very low-----	0.20	
63----------	0-60	60-80	<0.06	0.14-0.19	7.4-8.4	High---------	0.32	5
Sumpf	60-75	10-80	0.06-0.2	0.14-0.19	7.4-8.4	High---------	0.32	
64----------	0-13	8-20	0.6-2.0	0.11-0.15	5.1-6.5	Low----------	0.43	5
Tabor	13-52	40-55	<0.06	0.14-0.18	4.5-5.5	High---------	0.32	
	52-80	25-45	<0.06	0.14-0.18	5.6-7.8	High---------	0.32	
65----------	0-16	8-20	0.6-2.0	0.04-0.10	5.1-6.5	Low----------	0.43	5
Tabor	16-52	40-55	<0.06	0.14-0.18	4.5-5.5	High---------	0.32	
66----------	0-28	2-10	6.0-20	0.04-0.10	5.1-6.5	Very low-----	0.24	5
Tremona	28-63	35-50	<0.06	0.12-0.18	4.5-6.0	High---------	0.28	
	63-80	25-45	<0.06	0.12-0.18	4.5-8.4	High---------	0.37	
67----------	0-22	2-10	6.0-20	0.04-0.10	5.1-6.5	Very low-----	0.24	5
Tremona	22-45	35-50	<0.06	0.12-0.18	4.5-6.0	High---------	0.28	
	45-60	25-45	<0.06	0.12-0.18	4.5-8.4	High---------	0.37	
68----------	0-13	60-80	<0.06	0.15-0.20	7.4-8.4	Very high----	0.32	5
Trinity								

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Map symbol and soil name	Depth	Clay <2mm	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors	
							K	T
	In	Pct	In/hr	In/in	pH			
69---------- Trinity	0-80	60-80	<0.06	0.15-0.20	7.4-8.4	Very high----	0.32	5
70---------- Trinity	0-34	60-80	<0.06	0.15-0.20	7.4-8.4	Very high----	0.32	5
71---------- Wilson	0-7	27-40	0.2-0.6	0.15-0.20	5.6-7.3	Low----------	0.43	5
	7-42	35-50	<0.06	0.14-0.20	5.6-8.4	High---------	0.37	
	42-77	35-50	<0.06	0.12-0.15	6.6-8.4	High---------	0.37	
72---------- Wilson	0-4	27-40	0.2-0.6	0.15-0.20	5.6-7.3	Low----------	0.43	5
	4-41	35-50	<0.06	0.14-0.20	5.6-8.4	High---------	0.37	
	41-60	35-50	<0.06	0.12-0.15	6.6-8.4	High---------	0.37	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the text explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
1---------- Arol	D	None---------	---	---	0-1.5	Perched	Oct-May	20-40	Soft	High-----	Moderate.
2---------- Asa	B	Rare---------	---	---	>6.0	---	---	>60	---	High-----	Low.
3, 4---------- Axtell	D	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate.
5---------- Belk	D	Rare---------	---	---	>6.0	---	---	>60	---	High-----	Low.
6, 7---------- Bleiblerville	D	None---------	---	---	>6.0	---	---	>60	---	High-----	Low.
8---------- Bosque	B	Frequent----	Brief-----	Oct-May	>6.0	---	---	>60	---	High-----	Low.
9, 10---------- Brazoria	D	Rare---------	---	---	1.0-3.0	Apparent	Dec-Feb	>60	---	High-----	Low.
11---------- Brenham	C	None---------	---	---	>6.0	---	---	>60	---	High-----	Low.
12, 13---------- Burleson	D	None---------	---	---	>6.0	---	---	>60	---	High-----	Low.
14, 15---------- Burlewash	D	None---------	---	---	>6.0	---	---	20-40	Soft	High-----	High.
16:* Burlewash part--- Gullied land part.	D	None---------	---	---	>6.0	---	---	20-40	Soft	High-----	High.
17:* Burlewash part---	D	None---------	---	---	>6.0	---	---	20-40	Soft	High-----	High.
Koether part-----	D	None---------	---	---	>6.0	---	---	7-20	Hard	Low------	High.
18, 19, 20-------- Carbengle	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low.
21, 22---------- Chazos	C	None---------	---	---	>6.0	---	---	>60	---	High-----	High.
23, 24---------- Clemville	B	Rare---------	---	---	>6.0	---	---	>60	---	High-----	Low.
25, 26---------- Crockett	D	None---------	---	---	>6.0	---	---	>60	---	High-----	Low.
27, 28, 29-------- Cuero	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Low.
30---------- Falba	D	None---------	---	---	0-1.5	Perched	Oct-May	20-40	Soft	High-----	Moderate.
31, 32, 33-------- Frelsburg	D	None---------	---	---	>6.0	---	---	>60	---	High-----	Low.
34---------- Gowen	B	Frequent----	Brief-----	May-Sep	>6.0	---	---	>60	---	Moderate	Low.

See footnotes at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
35, 36--Greenvine	D	None	---	---	>6.0	---	---	20-40	Soft	High	Low.
37--Kaufman	D	Frequent	Brief to long.	Feb-May	0-3.5	Apparent	Nov-Apr	>60	---	High	Low.
38:*											
Kiomatia part	A	Frequent	Brief	Feb-Jun	3.0-5.0	Apparent	Jan-Jul	>60	---	Low	Low.
Norwood part	B	Frequent	Very brief	Oct-Mar	>6.0	---	---	>60	---	High	Low.
39, 40, 41--Klump	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
42--Knolle	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
43, 44, 45--Latium	D	None	---	---	>6.0	---	---	>60	---	High	Low.
46--Lufkin	D	None	---	---	0-1.0	Perched	Oct-Mar	>60	---	High	Moderate.
47, 48--Mabank	D	None	---	---	0.6-1.0	Perched	Dec-Mar	>60	---	High	Moderate.
49--Nahatche	C	Frequent	Brief to long.	Nov-May	0-1.5	Apparent	Nov-May	>60	---	High	Moderate.
50--Norwood	B	Rare	---	---	>6.0	---	---	>60	---	High	Low.
51--Oklared	B	Rare	---	---	3.5-5.0	Apparent	Mar-May	>60	---	Moderate	Low.
52:*											
Oklared part	B	Occasional	Very brief	Jan-Jul	3.5-5.0	Apparent	Mar-May	>60	---	Moderate	Low.
Norwood part	B	Occasional	Very brief	Oct-Mar	>6.0	---	---	>60	---	High	Low.
53--Padina	B	None	---	---	>6.0	---	---	>60	---	High	Moderate.
54.* Pits											
55--Rehburg	C	None	---	---	1.5-3.0	Perched	Dec-Apr	40-60	Soft	High	High.
56, 57--Renish	C	None	---	---	>6.0	---	---	4-20	Hard	Moderate	Low.
58:*											
Renish part	C	None	---	---	>6.0	---	---	4-20	Hard	Moderate	Low.
Rock outcrop part.											
59--Shalba	D	None	---	---	0-1.5	Perched	Oct-May	7-20	Soft	High	Moderate.
60:*											
Shalba part	D	None	---	---	0-1.5	Perched	Oct-May	7-20	Soft	High	Moderate.
Rock outcrop part.											
61, 62--Silawa	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.

See footnotes at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
63---------- Sumpf**	D	Frequent----	Very long	Sep-Jun	+1-2.0	Apparent	Jan-Dec	>60	---	High-----	Low.
64, 65---------- Tabor	D	None--------	---	---	>6.0	---	---	>60	---	High-----	High.
66, 67---------- Tremona	C	None--------	---	---	1.5-3.5	Perched	Jun-Sep	>60	---	High-----	High.
68---------- Trinity	D	Occasional	Brief to long.	Feb-May	0-3.0	Apparent	Nov-Feb	>60	---	High-----	Low.
69, 70---------- Trinity	D	Frequent----	Long.	Feb-May	0-3.0	Apparent	Nov-Feb	>60	---	High-----	Low.
71, 72---------- Wilson	D	None--------	---	---	0-1.0	Perched	Nov-Mar	>60	---	High-----	High.

* See description of the map unit for composition and behavior characteristics of the map unit.
** A plus sign under "Depth to high water table" indicates that the water table is above the surface of the soil.

TABLE 17.--ENGINEERING TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution[1]									Liquid limit[2]	Plasticity index[2]	Specific gravity	Shrinkage		
			Percentage passing sieve--						Percentage smaller than--								
	AASHTO	Unified	5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm				Limit	Linear	Ratio
												Pct			Pct	Pct	Pct
Asa silt loam:[3] (S73TX-239-004)																	
A12---- 9 to 19	A-4(04)	CL	100	100	100	100	100	73	57	19	17	26	9	2.64	16.0	5.3	1.8
B22----28 to 49	A-4(03)	CL-ML	100	100	100	100	100	69	52	17	15	25	7	2.66	17.0	4.5	1.7
Bleiblerville clay:[4] (S77TX-477-004)																	
A1----- 0 to 33	A-7-6(48)	CH	100	100	100	100	99	89	87	65	57	71	49	2.70	10.0	24.2	2.0
A12----33 to 63	A-7-6(50)	CH	100	100	100	100	99	90	90	66	58	71	51	2.72	9.0	24.3	2.1
AC-----63 to 75	A-7-6(63)	CH	100	100	100	100	100	97	95	82	71	79	57	2.73	10.0	25.8	2.0
Brenham clay loam:[5] (S73TX-239-002)																	
B21ca--10 to 28	A-7-6(30)	CL	100	99	99	99	98	96	89	58	43	49	28	2.70	17.0	14.1	1.8
IIC1ca-48 to 61	A-7-6(38)	CH	100	100	100	100	100	99	96	57	44	53	35	2.72	14.0	17.0	1.9
Burlewash fine sandy loam[6] (S73TX-239-008)																	
B21t--- 4 to 11	A-7-6(08)	CL	100	100	100	100	100	55	52	43	43	41	21	2.62	16.0	11.8	1.8
B22t---11 to 19	A-7-6(09)	CL	100	100	100	100	100	55	54	47	46	41	22	2.64	15.0	12.3	1.8
Burlewash fine sandy loam[7] (S70TX-239-001)																	
B2t---- 6 to 21	A-7-6(15)	CL	100	100	100	100	100	66	57	43	40	46	25	--	17.0	13.0	1.7
B3-----21 to 27	A-7-6(08)	CL	100	100	100	100	100	56	49	28	23	41	20	--	23.0	7.8	1.5
Carbengle clay loam:[8] (S73TX-239-009)																	
B2ca---12 to 23	A-6(12)	CL	100	100	100	100	98	82	78	39	22	34	16	2.68	16.0	8.7	1.8
Clemville silt loam:[9] (S73TX-239-003)																	
C1----- 6 to 20	A-6(21)	CL	100	100	100	100	100	97	88	37	28	38	21	1.70	15.0	11.5	1.9
C2-----20 to 43	A-7-6(36)	CH	100	100	100	100	100	99	95	60	45	52	33	2.73	13.0	17.4	1.9
Crockett fine sandy loam:[10] (S73TX-239-010)																	
B22t---14 to 26	A-7-6(20)	CL	100	100	100	100	98	76	66	38	36	43	28	2.65	13.0	14.3	1.9
B3-----51 to 80	A-7-6(23)	CL	100	100	100	100	98	78	72	35	31	33	44	2.68	12.0	15.2	1.9
Frelsburg clay:[11] (S77TX-477-005)																	
A1----- 0 to 8	A-7-6(53)	CH	100	100	100	100	99	92	90	67	57	74	51	2.72	10.0	24.4	2.0
A12---- 8 to 55	A-7-6(55)	CH	100	100	100	99	98	92	91	71	60	76	53	2.71	8.0	25.4	2.0
ACca---55 to 75	A-7-6(45)	CH	100	100	100	99	97	94	94	71	56	63	44	2.73	8.0	22.7	2.1
Knolle loamy fine sand[12] (S70TX-239-002)																	
A1----- 0 to 14	A-2-4(00)	SP-SM	100	100	100	100	96	11	9	5	4	21	3	--	19.0	0.3	1.7
B21t---19 to 24	A-6(04)	SC	100	100	100	100	98	44	43	38	35	39	17	--	21.0	8.7	1.7
B3-----38 to 58	A-2-4(00)	SC	100	100	100	100	94	23	22	17	15	28	10	--	19.0	4.4	1.7

See footnotes at end of table.

TABLE 17.--ENGINEERING TEST DATA--Continued

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution[1]									Liquid limit[2]	Plasticity index[2]	Specific gravity	Shrinkage		
			Percentage passing sieve--						Percentage smaller than--								
	AASHTO	Unified	5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm				Limit	Linear	Ratio
												Pct			Pct	Pct	Pct
Latium clay:[13] (S77TX-447-003)																	
A1----- 0 to 4	A-7-6(40)	CH	100	100	100	100	99	91	88	62	52	60	40	2.66	10.0	20.7	2.0
AC1---- 4 to 33	A-7-6(43)	CH	100	100	100	100	100	97	92	72	66	58	40	2.72	11.0	20.4	2.0
AC2----33 to 50	A-7-6(60)	CH	100	100	100	100	100	99	96	80	68	74	53	2.73	11.0	24.4	2.0
C------50 to 70	A-7-6(61)	CH	100	100	100	100	100	99	96	81	70	75	54	2.77	11.0	24.3	2.0
Lufkin fine sandy loam:[14] (S73TX-239-007)																	
B23tg--15 to 35	A-7-6(17)	CL	100	100	100	100	99	65	60	38	46	46	31	2.67	11.0	16.3	2.0
B3g----35 to 48	A-7-6(23)	CL-CH	100	100	100	100	99	71	65	42	37	50	35	2.70	13.0	17.0	1.9
Cg-----48 to 80	A-6(10)	CL	100	100	100	100	100	54	48	31	28	40	26	2.62	14.0	12.4	1.8
Tremona loamy fine sand:[15] (S73TX-239-006)																	
A1----- 0 to 17	A-2-4(00)	SM	100	100	100	100	99	34	23	4	3	19	2	2.63	17.0	0.8	1.7
B22t---31 to 48	A-7-6(13)	CL	100	100	100	100	100	62	55	40	39	42	26	2.67	13.0	13.7	1.9
B3-----63 to 84	A-6(03)	SC	100	100	100	100	100	45	34	24	23	32	15	2.65	30.0	6.2	1.7

[1]For soil materials larger than 3/8 inch, square mesh wire sieves were used that are slightly larger than equivalent round sieves, but these differences do not seriously affect the data.

[2]Liquid limit and plastic index values were determined by the AASHTO-89 and AASHTO-90 methods except that soil was added to water.

[3]Asa silt loam:
1.5 miles east and south on Farm Road 1370 from junction with Farm Road 2726; 1.2 miles east on private road; 200 feet north in cultivated field.

[4]Bleiblerville clay:
1.1 miles east of junction U.S. 290 and Farm Road 155; 1.25 mile south on Farm Road 1371; 0.2 mile west of road in hay field.

[5]Brenham clay loam:
From junction of Farm Road 2726 and Farm Road 1155; 1.2 miles northeast on Farm Road 2726, 0.2 mile east on county road and 0.8 mile southeast on county road and 1,200 feet southwest in a pasture.

[6]Burlewash fine sandy loam:
1.5 miles east on County Road 5 from junction of County Road 1; 1.3 miles north on field road; 1,500 feet west in pasture.

[7]Burlewash fine sandy loam:
From the junction of Farm Road 1627 and Farm Road 2780, west 6.3 miles on Farm Road 2780; this point is 0.2 mile west of ranch entrance and 100 feet southwest of road.

[8]Carbengle clay loam:
From William Penn northeast of Brenham, 2 miles north on Farm Road 1935; 0.2 mile west on county road; and 250 feet south in meadow.

[9]Clemville silt loam:
0.5 mile east of Wellmans store on Farm Road 1370; 1.1 miles southeast on private road and 400 feet east in cultivated field.

[10]Crockett fine sandy loam:
From junction of Farm Road 1370 and Farm Road 912, 2.6 miles south and east on Farm Road 1370; 0.3 mile east on private road, and 50 feet east.

[11]Frelburg clay:
3.6 miles north of junction Texas 105 and Farm Road 50; 0.8 mile west on paved road; 2.2 miles northwest on gravel road; 500 feet southeast in rangeland.

[12]Knolle loamy fine sand:
From junction of U.S. 290 and Farm Road 577 east of Brenham east on U.S. 290 1 mile; 1.0 mile south on county road then .55 mile west.

[13]Latium clay:
3.0 miles east of junction U.S. 290 and Farm Road 577 on U.S. 290; 0.8 mile south on gravel road; 300 feet west in rangeland.

[14]Lufkin fine sandy loam: From Burton, 3 miles east on U.S. Highway 290; 5.1 miles northwest on Farm Road 1948; 2.0 mile northwest; 0.2 miles east; 200 feet south.

[15]Tremona loamy fine sand:
From junction of U.S. Highway 290 and Farm Road 1948, 5.1 miles northwest on Farm Road 1948; 3.7 miles west and north; 0.6 mile east on a private road and 200 feet north.

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Arol	Fine, montmorillonitic, thermic Typic Albaqualfs
*Asa	Fine-silty, mixed, thermic Fluventic Haplustolls
Axtell	Fine, montmorillonitic, thermic Udertic Paleustalfs
Belk	Clayey over loamy, mixed, thermic Fluventic Eutrochrepts
Bleiblerville	Fine, montmorillonitic, thermic Udic Pellusterts
Bosque	Fine-loamy, mixed, thermic Cumulic Haplustolls
*Brazoria	Very-fine, mixed, thermic Typic Chromuderts
Brenham	Fine-silty, carbonatic, thermic Typic Calciustolls
Burleson	Fine, montmorillonitic, thermic Udic Pellusterts
Burlewash	Fine, montmorillonitic, thermic Ultic Paleustalfs
Carbengle	Fine-loamy, carbonatic, thermic Typic Calciustolls
Chazos	Fine, mixed, thermic Aquic Paleustalfs
Clemville	Fine-silty, mixed (calcareous), thermic Typic Udifluvents
Crockett	Fine, montmorillonitic, thermic Udertic Paleustalfs
*Cuero	Fine-loamy, mixed, thermic Pachic Argiustolls
Falba	Fine, montmorillonitic, thermic Typic Albaqualfs
Frelsburg	Fine, montmorillonitic, thermic Udorthentic Pellusterts
Gowen	Fine-loamy, mixed, thermic Cumulic Haplustolls
Greenvine	Fine, montmorillonitic, thermic Udic Pellusterts
Kaufman	Very-fine, montmorillonitic, thermic Typic Pelluderts
Kiomatia	Sandy, mixed, thermic Typic Udifluvents
Klump	Fine-loamy, siliceous, thermic Udic Argiustolls
Knolle	Fine-loamy, siliceous, thermic Ultic Haplustalfs
Koether	Sandy-skeletal, siliceous, thermic Lithic Ustorthents
Latium	Fine, montmorillonitic, thermic Udorthentic Chromusterts
Lufkin	Fine, montmorillonitic, thermic Vertic Albaqualfs
Mabank	Fine, montmorillonitic, thermic Vertic Albaqualfs
Nahatche	Fine-loamy, mixed, nonacid, thermic Aeric Fluvaquents
Norwood	Fine-silty, mixed (calcareous), thermic Typic Udifluvents
Oklared	Coarse-loamy, mixed (calcareous), thermic Typic Udifluvents
Padina	Loamy, siliceous, thermic Grossarenic Paleustalfs
Rehburg	Loamy, mixed, thermic Arenic Albaqualfs
Renish	Loamy, mixed, thermic Lithic Haplustolls
Shalba	Clayey, montmorillonitic, thermic, shallow Typic Albaqualfs
Silawa	Fine-loamy, siliceous, thermic Ultic Haplustalfs
Sumpf	Very-fine, mixed (calcareous), thermic Cumulic Haplaquolls
*Tabor	Fine, montmorillonitic, thermic Udertic Paleustalfs
*Tremona	Clayey, mixed, thermic Aquic Arenic Paleustalfs
Trinity	Very-fine, montmorillonitic, thermic Typic Pelluderts
Wilson	Fine, montmorillonitic, thermic Vertic Ochraqualfs

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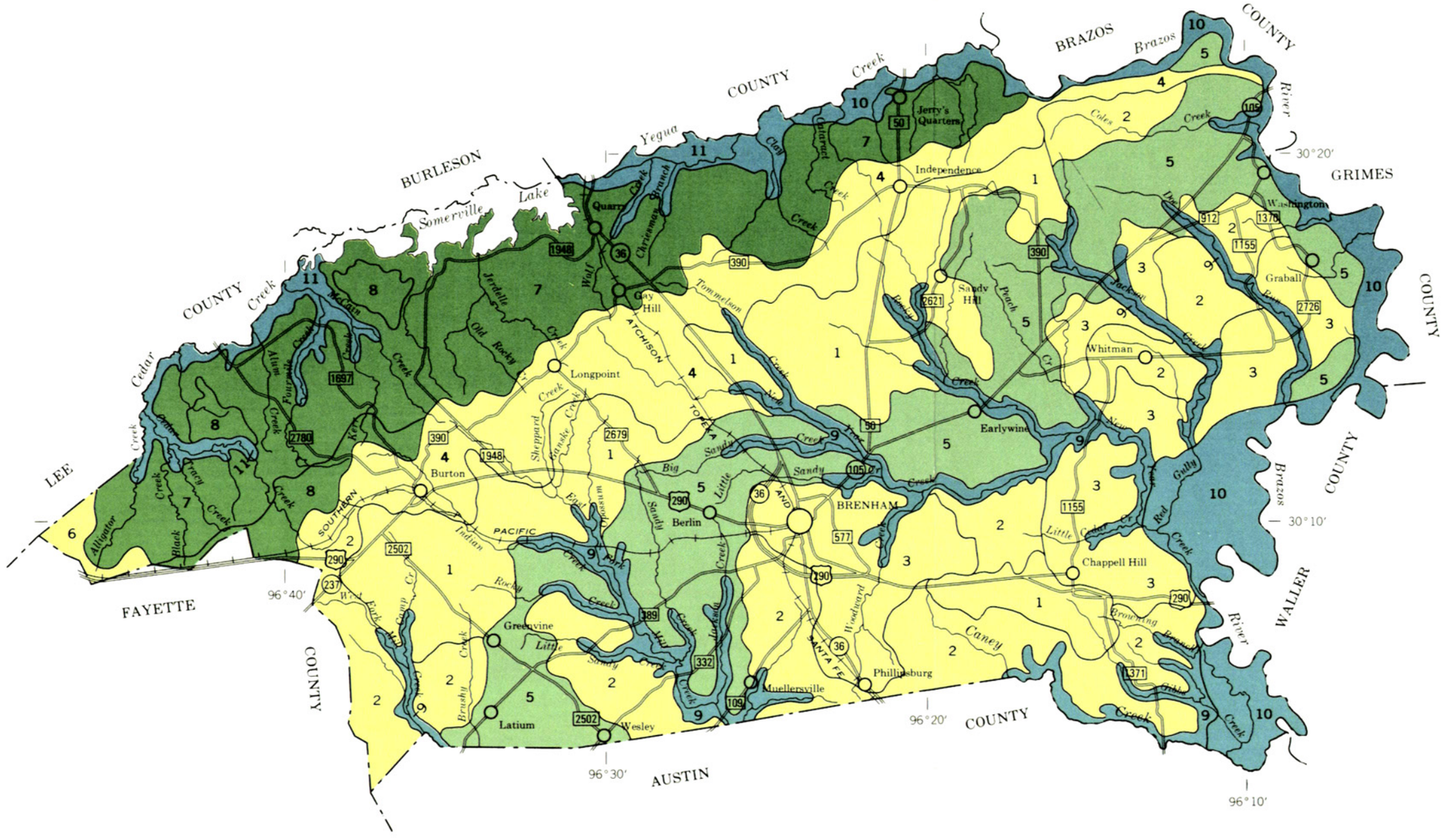


LEGEND*

WELL DRAINED AND MODERATELY WELL DRAINED, CLAYEY AND LOAMY SOILS; ON UPLANDS

1 — Bleiblerville-Frelsburg: Deep, gently sloping and sloping, moderately alkaline, clayey soils

2 — Frelsburg-Latium: Deep, gently sloping to strongly sloping, moderately alkaline, clayey soils

3 — Carbengle-Klump: Moderately deep and deep, gently sloping and sloping, slightly acid to moderately alkaline, loamy and sandy soils

4 — Carbengle-Frelsburg-Renish: Deep to very shallow, gently sloping to strongly sloping, moderately alkaline, loamy and clayey soils

MODERATELY WELL DRAINED AND SOMEWHAT POORLY DRAINED, LOAMY AND SANDY SOILS; ON UPLANDS

5 — Chazos-Tremona-Crockett: Deep, gently sloping and sloping, medium acid, sandy and loamy soils

6 — Tabor: Deep, gently sloping, slightly acid, very gravelly loamy soils

WELL DRAINED AND SOMEWHAT POORLY DRAINED, LOAMY SOILS; ON UPLANDS AND TERRACES

7 — Falba-Burlewash: Moderately deep, gently sloping and sloping, strongly acid and very strongly acid, loamy soils

8 — Lufkin-Mabank: Deep, nearly level and gently sloping, strongly acid and medium acid, loamy soils

WELL DRAINED AND SOMEWHAT POORLY DRAINED, CLAYEY AND LOAMY SOILS; ON BOTTOM LANDS

9 — Bosque-Trinity: Deep, nearly level, moderately alkaline, loamy and clayey soils

10 — Brazoria: Deep, nearly level, moderately alkaline, clayey soils

11 — Kaufman-Gowen: Deep, nearly level, mildly alkaline and neutral, clayey and loamy soils

*The soil reaction and texture noted in the descriptive headings applies to the surface layer of the major soils. The soil reaction shown is typical for the series.

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

Compiled 1979

N

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION

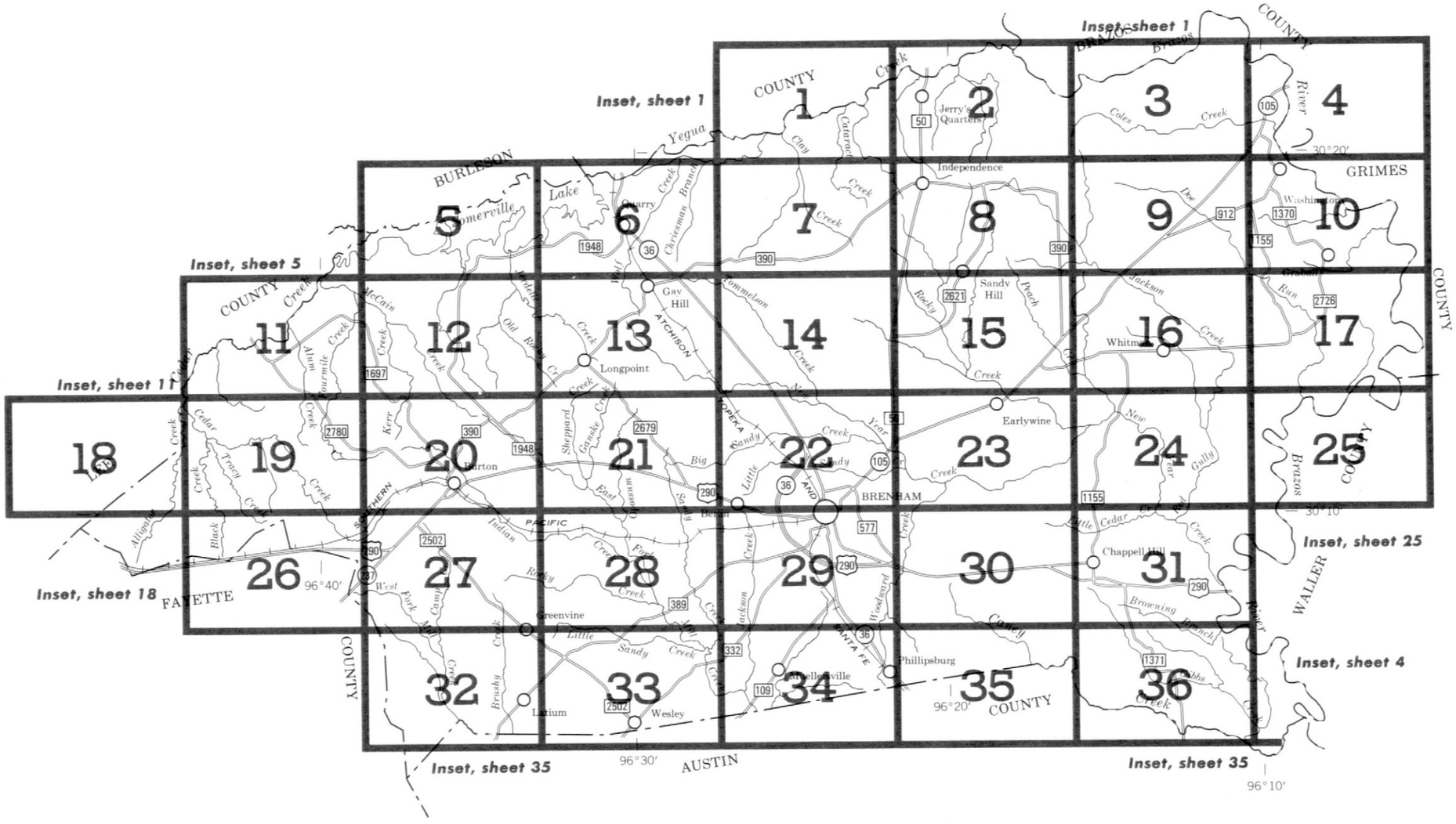
GENERAL SOIL MAP

WASHINGTON COUNTY, TEXAS

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km



Original text from each individual map sheet read:
This map is compiled on 1977 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and Cooperating Agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

INDEX TO MAP SHEETS

WASHINGTON COUNTY, TEXAS

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline
- AD HOC BOUNDARY (label) — Hedley Airstrip
- Small airport, airfield, park, oilfield, cemetery, or flood pool — FLOOD POOL LINE
- STATE COORDINATE TICK
- LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 21
- Federal — 173
- State — 28
- County, farm or ranch — 1283

- RAILROAD
- POWER TRANSMISSION LINE (normally not shown)
- PIPE LINE (normally not shown)
- FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water — w

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end

Canals or ditches

- Double-line (label) — CANAL
- Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water — w
- Intermittent — int — i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

- SOIL DELINEATIONS AND SYMBOLS — CnB | WaC2
- ESCARPMENTS
  - Bedrock (points down slope)
  - Other than bedrock (points down slope)
- SHORT STEEP SLOPE
- GULLY
- DEPRESSION OR SINK
- SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

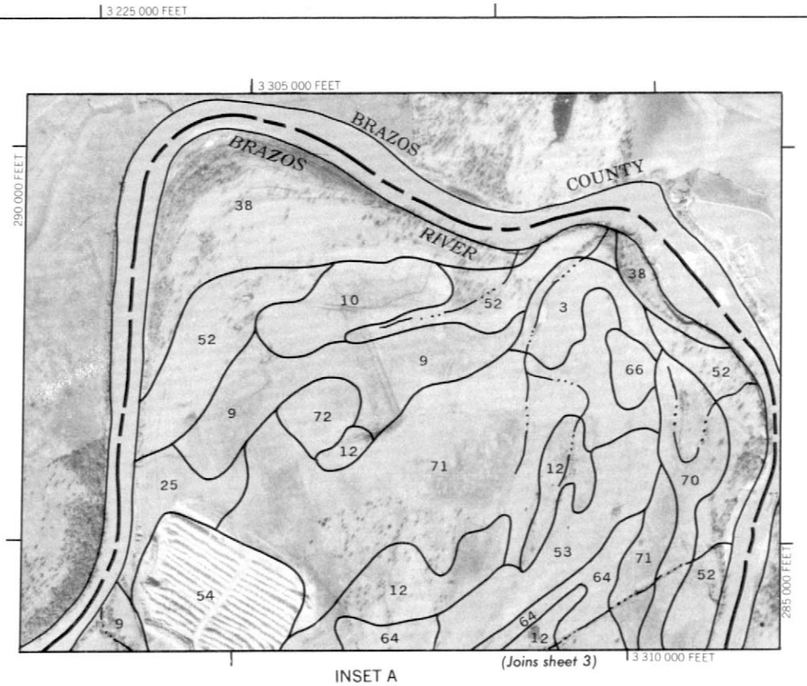
- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

SOIL LEGEND

The map symbols are numeric. Soil names followed by the superscript 1/ indicate broadly defined units. These units will be footnoted in the legend of the published survey as follows:

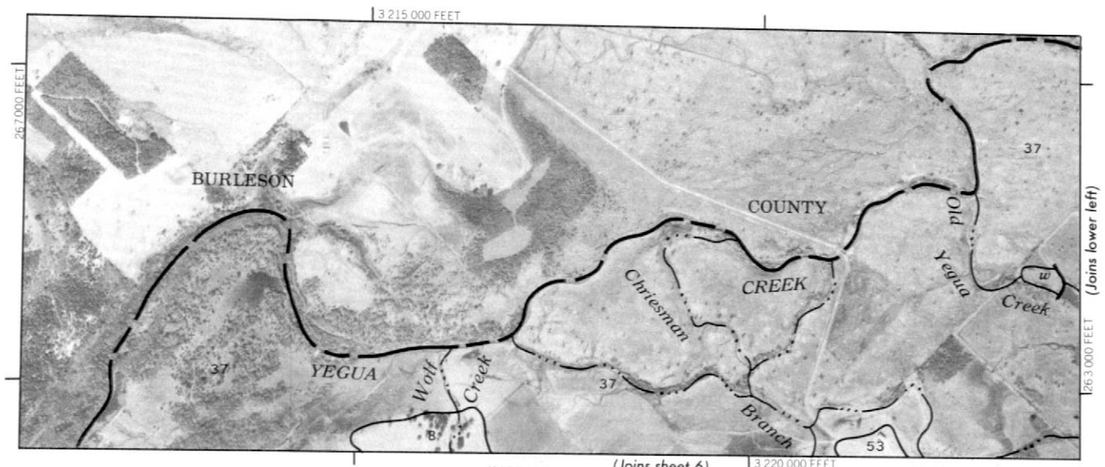
SYMBOL	NAME
1	Arol fine sandy loam, 1 to 5 percent slopes
2	Asa silt loam, 0 to 1 percent slopes
3	Axtell fine sandy loam, 1 to 5 percent slopes
4	Axtell fine sandy loam, 5 to 12 percent slopes
5	Belk clay, 0 to 1 percent slopes
6	Bleiblerville clay, 1 to 3 percent slopes
7	Bleiblerville clay, 3 to 5 percent slopes
8	Bosque clay loam, frequently flooded
9	Brazoria clay, 0 to 1 percent slopes
10	Brazoria clay, 1 to 3 percent slopes
11	Brenham clay loam, 3 to 8 percent slopes
12	Burleson clay, 0 to 1 percent slopes
13	Burleson clay, 1 to 3 percent slopes
14	Burlewash fine sandy loam, 1 to 5 percent slopes
15	Burlewash fine sandy loam, 5 to 20 percent slopes
16	Burlewash-Gullied land complex, 5 to 20 percent slopes
17	Burlewash-Koether 1/ association, steep
18	Carbengle clay loam, 1 to 3 percent slopes
19	Carbengle clay loam, 3 to 5 percent slopes
20	Carbengle clay loam, 5 to 8 percent slopes
21	Chazos loamy fine sand, 1 to 5 percent slopes
22	Chazos loamy fine sand, 5 to 8 percent slopes
23	Clemville silt loam, 0 to 1 percent slopes
24	Clemville silt loam, 1 to 3 percent slopes
25	Crockett fine sandy loam, 1 to 5 percent slopes
26	Crockett fine sandy loam, 5 to 10 percent slopes, eroded
27	Cuero sandy clay loam, 1 to 3 percent slopes
28	Cuero sandy clay loam, 3 to 5 percent slopes
29	Cuero sandy clay loam, 5 to 8 percent slopes
30	Falba fine sandy loam, 1 to 5 percent slopes
31	Frelsburg clay, 1 to 3 percent slopes
32	Frelsburg clay, 3 to 5 percent slopes
33	Frelsburg clay, 5 to 8 percent slopes
34	Gowen clay loam, frequently flooded
35	Greenvine clay, 1 to 3 percent slopes
36	Greenvine clay, 3 to 5 percent slopes
37	Kaufman clay, frequently flooded
38	Kiomatia and Norwood soils, frequently flooded
39	Klump loamy sand, 1 to 3 percent slopes
40	Klump loamy sand, 3 to 5 percent slopes
41	Klump loamy sand, 5 to 8 percent slopes
42	Knolle coarse sand, 2 to 8 percent slopes
43	Latium clay, 3 to 5 percent slopes
44	Latium clay, 5 to 8 percent slopes
45	Latium clay, 4 to 12 percent slopes, eroded
46	Lufkin fine sandy loam, 0 to 1 percent slopes
47	Mabank fine sandy loam, 0 to 1 percent slopes
48	Mabank fine sandy loam, 1 to 3 percent slopes
49	Nahatche clay loam, frequently flooded
50	Norwood silt loam, 0 to 1 percent slopes
51	Oklared very fine sandy loam, 0 to 1 percent slopes
52	Oklared-Norwood complex, occasionally flooded
53	Padina loamy fine sand, 1 to 5 percent slopes
54	Pits
55	Rehburg loamy fine sand, 1 to 5 percent slopes
56	Renish clay loam, 1 to 5 percent slopes
57	Renish clay loam, 5 to 12 percent slopes
58	Renish-Rock outcrop complex, 1 to 12 percent slopes
59	Shalba fine sandy loam, 1 to 5 percent slopes
60	Shalba-Rock outcrop complex, 1 to 8 percent slopes
61	Silawa loamy fine sand, 1 to 5 percent slopes
62	Silawa loamy fine sand, 5 to 8 percent slopes
63	Sumpf clay, frequently flooded
64	Tabor fine sandy loam, 1 to 5 percent slopes
65	Tabor very gravelly fine sandy loam, 1 to 5 percent slopes
66	Tremona loamy fine sand, 1 to 5 percent slopes
67	Tremona loamy fine sand, 5 to 8 percent slopes
68	Trinity clay, occasionally flooded
69	Trinity clay, frequently flooded
70	Trinity clay, depressional
71	Wilson clay loam, 0 to 1 percent slopes
72	Wilson clay loam, 1 to 3 percent slopes

1/ The composition of these units is more variable than that of others in the survey area, but is controlled well enough to be interpreted for the expected use of the soils.

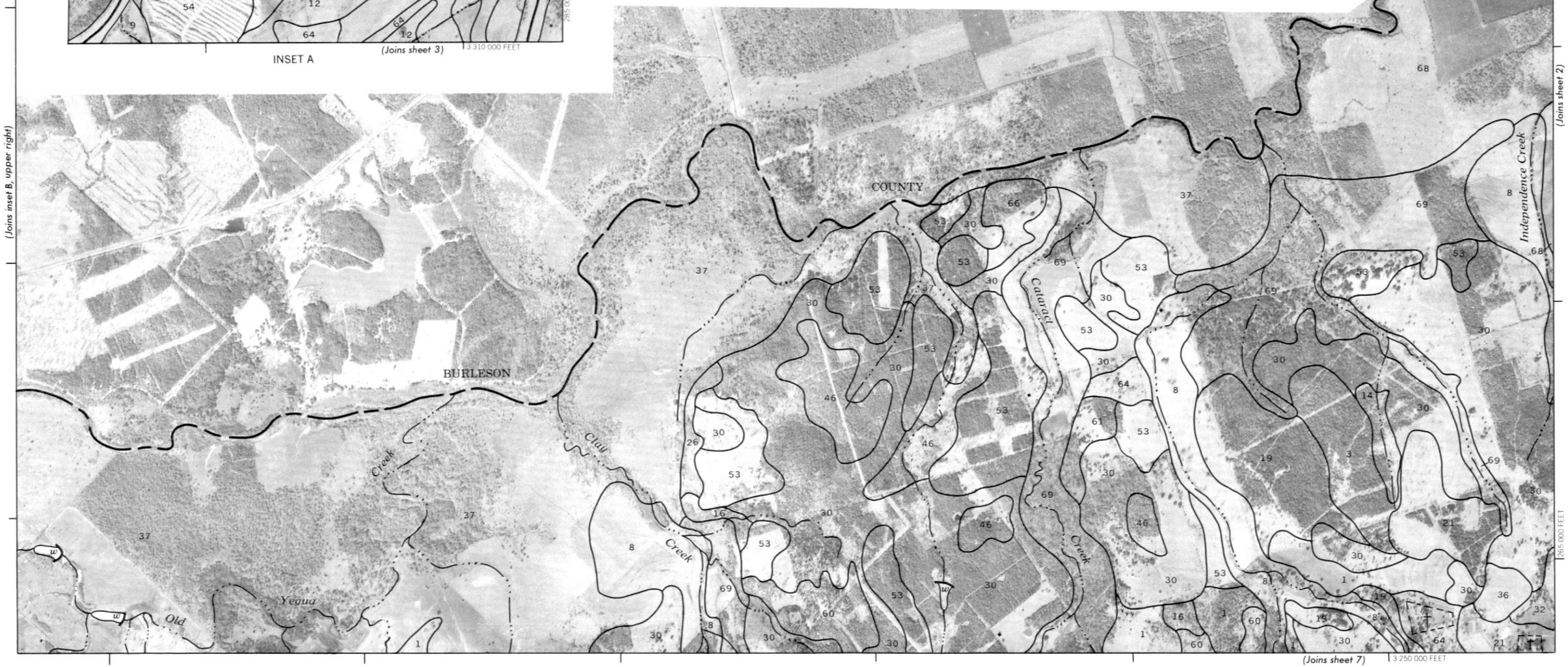


INSET A

(Joins sheet 3)



INSET B



2 Miles
10000 Feet
1
5000
Scale 1:24000
0 0
¼ 1000
½ 2000
¾ 3000
1 4000
5000

1
N

WASHINGTON COUNTY, TEXAS — SHEET NUMBER 2

(2)

N

Scale 1:24000

2 Miles 1 0 10000 Feet

1 0 5000

¼ ½ ¾ 0 1000 2000 3000 4000 5000

3 280 000 FEET

280 000 FEET

265 000 FEET

3 255 000 FEET

(Joins sheet 1)

(Joins sheet 3)

(Joins sheet 8)

COUNTY CREEK

YEGUA

BURLESON

Branch

Jerrys Quarters

Hale

Independence Creek

BRAZOS

BRAZOS RIVER

COUNTY

3

N

3 285 000 FEET

280 000 FEET

(Joins inset A, sheet 1)

BRAZOS COUNTY

BRAZOS RIVER

BRAZOS RIVER

HIDALGO BLUFFS

Coles Creek

Coles Creek

(Joins sheet 2)

(Joins sheet 4)

(Joins sheet 9)

265 000 FEET

3 310 000 FEET

2 Miles

10000 Feet

Scale 1:24000

4

N

Scale 1:24000

2 Miles 1 0 1

10 000 Feet 5 000 0 5 000

¼ 0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000

3 320 000 FEET

3 325 000 FEET

280 000 FEET

185 000 FEET

170 000 FEET

265 000 FEET

3 315 000 FEET

BRAZOS

WALLER

COUNTY

RIVER

GRIMES COUNTY

AUSTIN

Coles Creek

Jordan Creek

Gibbs Creek

Caney Creek

Washington

(Joins sheet 3)

(Joins sheet 10)

(Joins sheet 35)

N

3 165 000 FEET

260 000 FEET

3 160 000 FEET

247 000 FEET

242 000 FEET

COUNTY BOUNDARY

LEE

APPROXIMATE

MC CAIN CREEK PARK

McCain Cr

(Joins lower left)

(Joins sheet 11)

3 165 000 FEET

COUNTY

LAKE

BURLESON

SOMERVILLE

LEE CO

PARK

Creek

Rocky

Sally

Burns Creek

Jerdelle

(Joins sheet 6)

(Joins inset)

(Joins sheet 12)

3 190 000 FEET

245 000 FEET

2 Miles

1

10 000 Feet

5 000

Scale 1:24000

6

N

2 Miles

10000 Feet

1

5000

Scale 1:24000

0

0

1000

2000

3000

4000

5000

(Joins sheet 5)

(Joins inset B, sheet 1)

3 220 000 FEET

260 000 FEET

245 000 FEET

3 195 000 FEET

(Joins sheet 13)

(Joins sheet 7)

BURLESON

SOMERVILLE LAKE

COUNTY

water

Green Mountain

OVERLOOK PARK

ATCHISON TOPEKA AND SANTA FE

YEGUA CREEK PARK

Quarry

Wolf Creek

Wolf Branch

Sandy Branch

Christyan Branch

1948

390

WASHINGTON COUNTY, TEXAS — SHEET NUMBER 7

7

3 225 000 FEET

(Joins sheet 1)

260 000 FEET

Clay Creek

Cataract Creek

water

(Joins sheet 6)

(Joins sheet 8)

(Joins sheet 14)

3 250 000 FEET

N

2 Miles

10000 Feet

Scale 1:24000

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

245 000 FEET

8

N

Scale 1:24000

2 Miles 10000 Feet

1 5000

0 0

¼ 1000

½ 2000

¾ 3000

1 4000

1¼ 5000

(Joins sheet 2)

(Joins sheet 7)

(Joins sheet 9)

(Joins sheet 15)

3 280 000 FEET

260 000 FEET

245 000 FEET

3 255 000 FEET

BAYLOR UNIVERSITY STATE PARK

Independence

Independence Creek

Little Rocky Creek

Sandy Hill

Hardeman Branch

William Penn

Jackson Creek

50

390

2621

1935

(Joins sheet 3)

(Joins sheet 8)

(Joins sheet 10)

(Joins sheet 16)

3 285 000 FEET

260 000 FEET

245 000 FEET

3 310 000 FEET

Doe Run

Doe Run

Jordan Creek

Jackson Creek

Sand Branch

9

N

2 Miles

10000 Feet

5000

Scale 1:24000

0 1000 2000 3000 4000 5000

10

N

2 Miles

10000 Feet

1

5000

Scale 1:24000

0 0 1000 2000 3000 4000 5000

(Joins sheet 4)

3 340 000 FEET

265 000 FEET

(Joins sheet 9)

245 000 FEET

3 315 000 FEET

(Joins sheet 17)

Washington

WASHINGTON STATE PARK

GRIMES COUNTY

BRAZOS RIVER

Jordan Creek

Rocky Creek

Dot Rum

1155 912 1370 1158 2726


3 140 000 FEET
240 000 FEET
(Joins inset, sheet 5)
3 133 000 FEET
227 000 FEET
220 000 FEET
(Joins lower left)
(Joins sheet 18)
3 136 000 FEET
COUNTY
LEE
APPROXIMATE
BOUNDARY
Cedar Creek
Creek
Cedar
Alum
Fourmile
Little
Panther Branch
1697
(Joins inset)
(Joins sheet 19)
3 165 000 FEET
225 000 FEET
(Joins sheet 12)
11
N
2 Miles
10000 Feet
Scale 1:24000
5000
0
1000
2000
3000
4000
5000

12

N

Scale 1:24000

2 Miles

10000 Feet

(Joins sheet 5)

(Joins sheet 11)

(Joins sheet 20)

(Joins sheet 13)

3 190 000 FEET

240 000 FEET

225 000 FEET

3 165 000 FEET

Shepherd Mountain

water

McCain Creek

Burns Creek

Keer Creek

Rocky Creek

Old Burns Creek

Jerdelle Creek

(Joins sheet 6)

(Joins sheet 12)

(Joins sheet 14)

(Joins sheet 21)

3 195 000 FEET

3 220 000 FEET

240 000 FEET

225 000 FEET

Gay Hill

Tommelson Creek

Wolf Creek

Jerdelle

Longpoint

Sheppard Creek

New Year Creek

water

ATCHISON TOPEKA AND SANTA FE

13

N

Scale 1:24000

2 Miles

10000 Feet

5000

WASHINGTON COUNTY, TEXAS — SHEET NUMBER 14

WASHINGTON COUNTY, TEXAS — SHEET NUMBER 15

15

3 255 000 FEET

(Joins sheet 8)

240 000 FEET

(Joins sheet 14)

(Joins sheet 16)

(Joins sheet 23)

3 280 000 FEET

225 000 FEET

N

Scale 1:24000

2 Miles 1 0

10000 Feet 5000 0

1 5000

¾ 4000

½ 3000

¼ 2000

0 1000

Little Rocky Creek

Hardeman Branch

Perch Creek

Rocky Creek

Kuykendall Creek

Rocky Creek

16

N

(Joins sheet 9)

3 310 000 FEET

245 000 FEET

Sand Branch

Jackson Creek

Goodwill

Whitman

Winkleman Creek

Peach Creek

2193

1155

(Joins sheet 15)

(Joins sheet 17)

225 000 FEET

3 285 000 FEET

(Joins sheet 24)

Scale 1:24000

2 Miles 10000 Feet 5000 0 1000 2000 3000 4000 5000

WASHINGTON COUNTY, TEXAS — SHEET NUMBER 17

17

3 315 000 FEET

245 000 FEET

(Joins sheet 10)

(Joins sheet 16)

(Joins sheet 25)

3 340 000 FEET

230 000 FEET

N

Scale 1:24000

2 Miles 1 0 1

10000 Feet 5000 0 5000

Graball

Brown College Community

BRAZOS RIVER

GRIMES COUNTY

WALLER COUNTY

Dug Run

(18)

N

2 Miles 10 000 Feet

1 5 000

Scale 1:24000

0 0

¼ 1 000

½ 2 000

¾ 3 000

1 4 000

5 000

(Joins lower right)

3 135 000 FEET

200 000 FEET

190 000 FEET

3 120 000 FEET

205 000 FEET

3 110 000 FEET

(Joins sheet 26)

(Joins inset, sheet 11)

220 000 FEET

(Joins sheet 19)

(Joins inset)

COUNTY BOUNDARY

APPROXIMATE

LEE

FAYETTE

COUNTY

Alligator Creek

Schoenberg Lake

Cedar Creek

Turkey Creek

290

S P

WASHINGTON COUNTY, TEXAS — SHEET NUMBER 19

19

3,140,000 FEET

(Joins sheet 11)

220,000 FEET

N

Scale 1:24000

2 Miles

10000 Feet

5000

0

1

5000

0

1000

2000

3000

4000

5000

Panther Branch

Alum Creek

Fourmile Creek

Bull Creek

Cedar Creek

Tracy Creek

Black Creek

Cedar Creek

Cedar Creek

White Bluffs

Nixon Lake

2780

(Joins sheet 18)

(Joins sheet 20)

(Joins sheet 26)

205,000 FEET

3,165,000 FEET

20

N

(Joins sheet 12)

3 195 000 FEET

2 Miles

10000 Feet

1

5000

(Joins sheet 19)

Scale 1:24000

0 0 1000 2000 3000 4000 5000

205 000 FEET

3 170 000 FEET

(Joins sheet 27)

(Joins sheet 21)

220 000 FEET

McCain Creek

East Fork

Mill Creek

Union Hill

Mayfield Creek

Indian Creek

Section Creek

SOUTHERN PACIFIC

Burton

21

N

3 195 000 FEET

220 000 FEET

(Joins sheet 13)

(Joins sheet 20)

(Joins sheet 22)

(Joins sheet 28)

205 000 FEET

3 225 000 FEET

Zionville

Sheppard Creek

Ganske Creek

Opossum Creek

East Fork Mill Creek

Big Sandy Creek

Sandy Creek

390 2679 1948 290

2 Miles 1 0 1 2 3 4 5

10000 Feet 5000 0 1000 2000 3000 4000

Scale 1:24000

22

N

2 Miles

10000 Feet

1

5000

Scale 1:24000

0 0

¼ 1000

2000

⅓ 3000

¾ 4000

1 5000

(Joins sheet 29)

(Joins sheet 21)

(Joins sheet 23)

(Joins sheet 14)

3 250 000 FEET

220 000 FEET

205 000 FEET

3 225 000 FEET

Tommelson Creek

New Year Creek

Big Sandy Creek

Little Sandy Creek

Hog Branch

BRENHAM MUNICIPAL AIRFIELD

Stockeks Lake

ATCHISON, TOPEKA AND SANTA FE

BRENHAM
(county seat)

Berlin

(Joins sheet 15)

3 255 000 FEET

220 000 FEET

Earlywine

Rocky Creek

SANITARY LAND FILL

Little Sandy Creek

New Year Creek

Ralston Creek

New Year Creek

Davis Creek

New Year Creek

(Joins sheet 22)

(Joins sheet 24)

(Joins sheet 30)

3 280 000 FEET

210 000 FEET

N

2 Miles

10000 Feet

Scale 1:24000

WASHINGTON COUNTY, TEXAS — SHEET NUMBER 24

24

N

(Joins sheet 16)

3 310 000 FEET

225 000 FEET

(Joins sheet 23)

210 000 FEET

3 285 000 FEET

(Joins sheet 31)

(Joins sheet 25)

Scale 1:24000

2 Miles 10000 Feet 5000

HUGHES LAKE

Peach Creek

Rocky Creek

Creek

Creek

Yeary

New

Jackson Creek

Gully

Red Creek

1155

2447


3 315 000 FEET
225 000 FEET
(Joins sheet 17)
(Joins sheet 24)
(Joins inset)
3 340 000 FEET
WALLER
COUNTY
BRAZOS
RIVER
(Joins lower left)
(Joins sheet 31)
205 000 FEET
200 000 FEET
210 000 FEET
3 320 000 FEET
N
2 Miles
10 000 Feet
5 000
Scale 1:24 000

26

N

(Joins sheet 19)

3 165 000 FEET

(Joins inset, sheet 18)

Tracy Creek

Black Creek

Cedar Creek

Homeymeyer Mountain

PACIFIC SOUTHERN

S P

FAYETTE

FAYETTE COUNTY

La Bahia

(Joins sheet 27)

3 185 000 FEET

3 140 000 FEET

200 000 FEET

2 Miles

10000 Feet

5000

Scale 1:24000

0 1000 2000 3000 4000 5000

3 170 000 FEET

200 000 FEET

(Joins sheet 20)

(Joins sheet 26)

(Joins sheet 28)

(Joins sheet 32)

3 195 000 FEET

185 000 FEET

N

Scale 1 : 24 000

2 Miles

10000 Feet

5000

0

1 0 1

¼ 0 ¼

½ 1000 ½

¾ 2000 ¾

1 3000 1

1¼ 4000 1¼

1½ 5000 1½

SOUTHERN PACIFIC

Cedar Creek

Indian Creek

Camp Creek

West Fork Mill Creek

Brushy Creek

290

237

2502

28

N

Scale 1:24000

2 Miles 1 0 1

10000 Feet 5000 0 5000

1/4 0 1/4 1/2 3/4 1

1000 2000 3000 4000

(Joins sheet 21)

3 220 000 FEET

200 000 FEET

(Joins sheet 27)

385 000 FEET

3 200 000 FEET

(Joins sheet 33)

(Joins sheet 29)

Lange Lake

East Opossum Creek

Indian Creek

Mill Fork Creek

Rocky Creek

Sandy Creek

SOUTHERN PACIFIC

389

3 225 000 FEET

200 000 FEET

(Joins sheet 22)

BRENHAM
(county seat)

PACIFIC SOUTHERN

Hoop Branch

Ralston Creek

Wood Creek

Jackson Branch

Meeting Branch

ATCHISON TOPEKA AND SANTA FE

Woodward Creek

(Joins sheet 28)

(Joins sheet 30)

(Joins sheet 34)

3 250 000 FEET

290 000 FEET

N

2 Miles

10 000 Feet

Scale 1:24000

1 0 1

¼ 0 ¼

½ 0 ½

¾ 0 ¾

1 000 2 000 3 000 4 000 5 000

WASHINGTON COUNTY, TEXAS — SHEET NUMBER 30

30

N

Scale 1:24000

2 Miles 1 0 1

10000 Feet 5000 0 5000

(Joins sheet 23)

(Joins sheet 29)

(Joins sheet 31)

(Joins sheet 35)

3 280 000 FEET

205 000 FEET

190 000 FEET

3 255 000 FEET

Ralston Creek

Davis Creek

Woodward Creek

Carnes Creek

(Joins sheet 24)

(Joins sheet 30)

(Joins sheet 36)

(Joins inset, sheet 25)

3 285 000 FEET

205 000 FEET

3 310 000 FEET

290 000 FEET

Chappell Hill

Little Cedar Creek

Red Gully

New Year

WALLER COUNTY

BRAZOS RIVER

Spring Branch

Browning Branch

N

Scale 1:24000

2 Miles

10000 Feet

5000

(Joins sheet 27)

3 195 000 FEET

N

2 Miles

10000 Feet

1

5000

Scale 1:24000

0

0

1000

¼

2000

½

3000

¾

4000

1

5000

165 000 FEET

3 170 000 FEET

(Joins inset A, sheet 35)

(Joins sheet 33)

80 000 FEET

FAYETTE COUNTY

AUSTIN COUNTY

APPROXIMATE BOUNDARY

Camp Creek

West Fork

Mill Creek

Brushy Creek

Pond Creek

Greenvine

Latium

2507

389

(Joins sheet 28)

(Joins sheet 32)

(Joins sheet 34)

3 200 000 FEET

3 225 000 FEET

180 000 FEET

170 000 FEET

Klump Community

Little Sandy Creek

East Mill Creek

Sandy Creek

Sandy Branch

Dogwood Creek

Williams Creek

Spring Branch

Wesley

APPROXIMATE BOUNDARY

AUSTIN COUNTY

2502

389

332

N

2 Miles

10000 Feet

Scale 1:24000

34

N

Scale 1:24000

2 Miles 1 0 1

10000 Feet 5000 0 5000

(Joins sheet 29)

(Joins sheet 33)

(Joins sheet 35)

3 250 000 FEET

185 000 FEET

170 000 FEET

3 230 000 FEET

Meeting Branch Creek

Jackson Creek

Muellersville

Shirtail Branch

East Mill Creek

Williams Creek

Woodward Creek

ATCHISON TOPEKA AND SANTA FE

Phillipsburg

APPROXIMATE BOUNDARY

AUSTIN COUNTY

(Joins sheet 30)

3 255 000 FEET

185 000 FEET

Woodward Creek

Caney Creek

(Joins sheet 36)

3 280 000 FEET

180 000 FEET

APPROXIMATE BOUNDARY AUSTIN COUNTY

(Joins sheet 34)

T & N O R R

(Joins sheet 32)

3 175 000 FEET

165 000 FEET

FAYETTE COUNTY

APPROXIMATE BOUNDARY AUSTIN COUNTY

3 180 000 FEET

160 000 FEET

INSET A

(Joins inset, sheet 4)

3 315 000 FEET

167 000 FEET

APPROXIMATE BOUNDARY AUSTIN COUNTY

3 320 000 FEET

164 000 FEET

INSET B

35

N

2 Miles

10 000 Feet

5 000

1

Scale 1:24000

0 1 000 2 000 3 000 4 000 5 000

36

N

Scale 1:24000

2 Miles 10000 Feet

1 5000 0 0 1000 2000 3000 4000 5000

(Joins sheet 31)

(Joins sheet 35)

(Joins inset, sheet 4)

3 310 000 FEET

3 285 000 FEET

170 000 FEET

185 000 FEET

WALLER COUNTY

BRAZOS RIVER

Browning Branch

Sauney Stand

Gibbs Creek

Caney Creek

APPROXIMATE AUSTIN COUNTY BOUNDARY

1371